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SELECTED WATER RESOURCES ABSTRACTS

VOLUME 9, NUMBER 21
NOVEMBER 1, 1976

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SELECTED WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center, Office of Water Research and Technology, U.S. Department of the Interior

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VOLUME 9, NUMBER 21
NOVEMBER 1, 1976

W76-11101 -- W76-11625

Secretary of the U.S. Department of the Interior has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

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FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into 10 fields and 60 groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on the inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the Bio-Science Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
U.S. Department of the Interior
Washington, DC 20240

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Includes the following Groups: Properties; Aqueous Solutions and Suspensions

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03 WATER SUPPLY AUGMENTATION AND CONSERVATION
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ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

1. NATURE OF WATER

1A. Properties

THE VOLUMETRIC PROPERTIES OF H20--A GRAPHICAL PORTRAYAL,
Geological Survey, Reston, Va.
J. R. Fisher.
Journal of Research of the U S Geological Survey, Vol 4, No 2, p 189-193, March-April 1976. 4 fig, 3 ref.

Descriptors: *Water properties, *Volumetric analysis, *Graphical analysis, Contours, Pressure, Density, Temperature.

A graphical display of the volumetric properties of water is presented as density (0.01 to 1.0 g/cm to the minus 3) contoured on pressure-temperature coordinates and pressure (1-10,000 bars) contoured on density-temperature coordinates over the temperature range 0-1,000 degrees C. Data were obtained from sources published during 1964-1969; several minor inconsistencies are observed and attributed to inadequacies in the equations of state used to describe experimental data obtained above 1,000 bars. (Woodard-USGS)
W76-11420

2. WATER CYCLE

2A. General

HYDROLOGIC ASPECTS OF FLOOD MANAGEMENT IN THE CHEMUNG RIVER BASIN,
Cornell Univ., Ithaca, N. Y. School of Civil and Environmental Engineering.
For primary bibliographic entry see Field 2E.
W76-11106

PROGRAMMABLE CALCULATORS: MODERN INSTRUMENTS FOR ANALYZING HYDROLOGIC DATA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 7B.
W76-11416

DECISION THEORY AND ITS APPLICATION TO NETWORK DESIGN,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7A.
W76-11498

INFLUENCE OF SIMPLIFICATIONS IN WATERSHED GEOMETRY IN SIMULATION OF SURFACE RUNOFF,
Agricultural Research Service, Tucson, Ariz.
L. J. Lane, D. A. Woolhiser, and V. Yevjevich.
Hydrology Papers, Colorado State University, Fort Collins, No. 81, December 1975. 52 p, 47 fig, 11 tab, 54 ref.

Descriptors: *Mathematical models, *Model studies, *Surface runoff, *Watersheds(Basins), Channels, Rainfall-runoff relationships, Overland flow, Hydrograph analysis, Runoff.
Identifiers: *Kinematic cascade model, Kinematic impulse response.

The effects of simplification in formulating mathematical models for analyzing surface runoff are described. The purpose is to develop objective procedures for geometric simplification of complex watersheds modeled as kinematic cascades of planes and channels. A useful conception of a watershed surface is that it consists of the channel network and interchannel areas of overland flow within the watershed perimeter. Basic models are outlined for watershed geometry and rainfall excess-surface runoff; analysis is made of overland flow over uniform and complex slopes, with specific discussion of storage at equilibrium, kinematic impulse response and pulse response. Runoff from complex watersheds is described using goodness-of-fit statistics for simplified geometry, hydrograph fitting and analysis of hydraulic roughness parameters. Kinematic impulse response analysis emphasizes the influence of surface configuration on overland flow. (Jahns-Arizona)
W76-11517

RIPARIAN DENDROCHRONOLOGY: A METHOD FOR DETERMINING FLOOD HISTORIES OF UNGAGED WATERSHEDS,
Arizona Univ., Tucson. Lab. of Tree-Ring Research.
For primary bibliographic entry see Field 4A.
W76-11523

2B. Precipitation

THE DETERMINATION OF REGIONAL EVAPOTRANSPIRATION BY MEANS OF STANDARD METEOROLOGICAL DATA,
Cornell Univ., Ithaca, N. Y. School of Civil and Environmental Engineering.
For primary bibliographic entry see Field 2D.
W76-11110

IFYGL WEATHER HIGHLIGHTS,
Atmospheric Environment Service, Toronto (Ontario). Lake and Marine Applications Section.
D. W. Phillips.
In: Proceedings, Seventeenth Conference on Great Lakes Research, Part 1; McMaster University, Hamilton (Ontario), August 12-14, 1974. International Association for Great Lakes Research, p 296-320, 1974. 7 fig, 5 tab, 14 ref.

Descriptors: *Weather, *Weather data, *Lake Ontario, *Great Lakes, Climatology, Meteorology, Rainfall, Snowfall, Precipitation(Atmospheric), Networks, Temperature, Flooding, Solar radiation, Winds, Evaporation, Evapotranspiration, Runoff, Hurricanes, Storms, Lakes.
Identifiers: *International Field Year for the Great Lakes, Hurricane Agnes, Weather highlights.

One of the principal goals of International Field Year for the Great Lakes (IFYGL) Project 24 ME, Climatological Studies, is to assist principal investigators by comparing monthly averages of various meteorological variable during the data-gathering period with normals computed from the 1941-1970 period. Before data interpretation and model testing begin or before results are extrapolated elsewhere, conditions under which the scientific data were collected should be known. The weather during the data-gathering period of IFYGL could be described as cold, stormy, and dull. The mean annual temperature was within one degree of normal; however, five months had temperatures between one and three standard deviations. The period was also one of almost continuous, heavy precipitation and frequent flooding. Total precipitation from April 1972 to March 1973 varied from 800 mm north north of Toronto to 1600 mm in the Adirondacks, averaging about 175 mm greater than normal. Every month had an above normal number of days with precipitation, for an annual total of 45 rain days more than usual. The number of hours of sunshine was almost 200 hours fewer than normal (90%). The outstanding weather event of the field year was the torrential rain and widespread flooding caused by Hurricane Agnes. Rains totalling more than a foot fell in parts of the basin from the evening of the 20th of June until the morning of the 25th. For most of the Ontario side five day totals ranged from two to three inches. (See also W76-11275) (Sims - ISWS)
W76-11299

DURATION-LIMITED WAVE SPECTRA IN LAKE ONTARIO DURING THE 1972 HURRICANE AGNES,
National Oceanic and Atmospheric Administration, Ann Arbor, Mich. Great Lakes Environmental Research Lab.
For primary bibliographic entry see Field 2H.
W76-11309

SOURCES OF WATER QUALITY, LAKE LEVEL, ICE, WATER TEMPERATURE, AND METEOROLOGICAL DATA FOR THE ST. LAWRENCE GREAT LAKES,
Wisconsin Univ., Milwaukee. Center for Great Lakes Studies.
For primary bibliographic entry see Field 7C.
W76-11363

CLOUD ANALYSIS AND DIAGNOSIS OVER LAKE ONTARIO AND VICINITY,
Center for the Environment and Man, Inc. Hartford, Conn.
For primary bibliographic entry see Field 2H.
W76-11432

GREAT LAKES WIND FORECASTS BASED ON MODEL OUTPUT STATISTICS,
National Weather Service, Silver Spring, Md. Techniques Development Lab.
For primary bibliographic entry see Field 2H.
W76-11434

OBJECTIVE ANALYSIS OF IFYGL SURFACE METEOROLOGICAL DATA,
National Oceanic and Atmospheric Administration, Washington, D. C.
For primary bibliographic entry see Field 2H.
W76-11435

THE ATMOSPHERIC BUDGETS PROGRAM OF IFYGL,
National Oceanic and Atmospheric Administration, Washington, D. C. Environmental Data Service.
For primary bibliographic entry see Field 2H.
W76-11436

DETERMINATION OF THE AERODYNAMIC DRAG COEFFICIENT FROM WIND SET-UP,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 2H.
W76-11437

TRANSIENT THERMAL RESPONSE OF LARGE LAKES TO ATMOSPHERIC DISTURBANCES,
Hydronautics Inc., Laurel Md.
For primary bibliographic entry see Field 2H.
W76-11439

2C. Snow, Ice, and Frost

TURBULENT KINETIC ENERGY BALANCE NEAR THE FROZEN SURFACE OF EASTERN LAKE ONTARIO,
York Univ., Downsview (Ontario). Dept. of Physics.
For primary bibliographic entry see Field 2H.
W76-11298

SELECTED SATELLITE DATA ON SNOW AND ICE IN THE GREAT LAKES BASIN 1972-73,
National Environmental Satellite Service, Washington, D. C.
D. R. Wiesnet, D. F. McGinnis, and D. G. Forsyth.

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In: Proceedings, Seventeenth Conference on Great Lakes Research, Part 1; McMaster University, Hamilton (Ontario), August 12-14, 1974. International Association for Great Lakes Research, p 334-347, 1974. 11 fig, 1 tab, 5 ref.

Descriptors: *Remote sensing, *Snow cover, *Ice cover, *Great Lakes, Satellite(Artificial), Snow, Ice, Mapping, Watersheds(Basins), Instrumentation, Infrared radiation, Lake ice, Temperature, Water temperature, Cloud cover, Water resources, Surveys.
Identifiers: *International Field Year for the Great Lakes, ERTS-1, NOAA-2.

Three snow-extent maps of the Lake Ontario drainage basin were prepared from NOAA-2 satellite visible band images during the IFYGL (1972-1973). These maps were discussed and the satellite data were evaluated for snow-extent mapping. The value of ERTS-1 imagery and digital data was also discussed in relation to the Lake Ontario basin studies. ERTS-1 MSS data are excellent for ice identification and analysis but are not useful for forecasting where timely receipt of data is imperative. NOAA-2 VHRR data are timely but the lower resolution of the VHRR makes identification of certain ice features difficult. NOAA-2 VHRR is well suited for snow-extent maps and thermal maps of large areas such as the 19,000 sq km Lake Ontario basin. (See also W76-11275) (Sims - ISWS)
W76-11301

SNOWMELT RUNOFF FROM PLANTED CONIFERS IN SOUTHWESTERN WISCONSIN,
Forest Service (USDA), St. Paul, Minn. North Central Forest Experiment Station.
For primary bibliographic entry see Field 4A.
W76-11369

FIELD STUDIES ON THE PHYTOTOXICITY OF CRUDE OIL TO SUBARCTIC AQUATIC VEGETATION,
For primary bibliographic entry see Field 5C.
W76-11405

THE TILTED FOREST: GLACIOLOGICAL-GEOLOGIC IMPLICATIONS OF VEGETATED NEOGLACIAL ICE AT LITUYA BAY, ALASKA,
Geological Survey, Tacoma, Wash.
A. Post, and G. Streveler.
Reprint from Quaternary Research, Vol 6, No 1, p 111-117, March 1976. 4 fig, 6 ref.

Descriptors: *Glaciers, *Alaska, *Vegetation effects, *Coniferous forests, *Glaciology, Time, Age, Dating, Time lag, Bays.
Identifiers: Lituya Bay(Ala).

Porter and Carson postulated that stagnant, forest-covered ice persisted as long as 2,000 years after the retreat of late Pleistocene glaciers in Puget Sound, Alaska, and cite as present examples several large, still active Alaskan glaciers which have forested margins. A better example was found in Lituya Bay, which was occupied by glacier ice until about 300-400 years ago. On the forested western side of the bay, tilted trees suggested buried ice; after considerable search, an exposure of clean, bubbly glacier ice was found under a mantle of forest duff and debris 1-2 m thick. The calculated melt rate suggests that some of this ice may persist for at least another 300 years. The 600+ years persistence of this stagnant ice supports the hypothesis that much larger forest-mantled deposits lingered as much as 2,000 years following the retreat of late Pleistocene glaciers. (Woodard-USGS)
W76-11423

2D. Evaporation and Transpiration

THE DETERMINATION OF REGIONAL EVAPOTRANSPIRATION BY MEANS OF STANDARD METEOROLOGICAL DATA,
Cornell Univ., Ithaca, N. Y. School of Civil and Environmental Engineering.
W. H. Brutsaert.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-256 213, $4.50 in paper copy, $3.00 in microfiche. Cornell University Water Resources and Marine Sciences Center, Completion Report, August 1976. 47 p, 6 fig., 7 tabs., 27 ref. OWRT B-052-NY(1). 14-34-0001-6101.

Descriptors: *Evapotranspiration, *Boundary layers, *Radiosoundes, *Water vapor, Atmospheric physics, Meteorological data, *Nebraska, Regional analysis, Watershed management.
Identifiers: Atmospheric boundary layers.

A recently proposed procedure to calculate actual regional evapotranspiration, using only regularly recorded upper air meteorological data, based on the parameterization of the turbulent atmospheric boundary layer was further investigated in an attempt to develop guidelines for its application in the solution of hydrological problems. In a first phase a comparison was continued between predicted evapotranspiration and measured watershed evapotranspiration in eastern Nebraska. It was found that contrary to the general assumption, the similarity function for water vapor in the atmospheric boundary layer is different from that for sensible heat. This prompted the second phase of the research which will consist of an exhaustive study of available meteorological data to obtain a more accurate determination of the water vapor and sensible heat transfer coefficients for the boundary layer. Preliminary results confirm the findings of the first phase.
W76-11110

COMPARISON OF METHODS FOR ESTIMATING POTENTIAL EVAPOTRANSPIRATION IN THE NORTH PLATTE BASIN OF WYOMING,
Wyoming Univ., Laramie. Dept. of Agricultural Engineering.
R. W. VanKlaveren, L. O. Pochop, and W. E. Hedstrom.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-256 236 $4.00 in paper copy, $3.00 in microfiche. Wyoming Water Resources Research Institute Laramie, Series No. 59, May 1976. 33 p, 27 fig, 8 ref. OWRT A-014-WYO(2), 14-31-0001-3851, 4051, 5051.

Descriptors: *Evapotranspiration, Model studies, *Wyoming, Evaporation pans, *Methodology, *Estimating.
Identifiers: Jensen-Haise method, Thornthwaite method, Blaney-Criddle method.

Three methods of estimating potential evapotranspiration, the Modified Jensen-Haise, Thornthwaite, and Blaney-Criddle methods, were evaluated and compared to adjusted pan evaporation. Average long-term daily estimates of evapotranspiration using the Modified Jensen-Haise method were generally higher while the values from the Thornthwaite and Blaney-Criddle methods were generally lower than adjusted pan evaporation. Estimates of evapotranspiration for stations where pan data were not available followed the same basic patterns. The Jensen-Haise method always gave the highest estimates and the Thornthwaite the lowest.
W76-11115

MONTHLY EVAPOTRANSPIRATION ESTIMATES FOR THE CANADIAN LAND PORTION OF THE LAKE ONTARIO BASIN DURING THE IFYGL,
Atmospheric Environment Service, Downsview (Ontario). Hydrometeorology and Environmental Impact Research Div.
H. L. Ferguson and W. D. Hogg.
In: Proceedings, Seventeenth Conference on Great Lakes Research, Part 1, McMaster University, Hamilton (Ontario), August 12-14, 1974. International Association for Great Lakes Research, p 269-287, 1974. 6 fig, 12 tab, 18 ref.

Descriptors: *Evapotranspiration, *Model studies, *Canada, *Lake Ontario, Evaporation, Mathematical models, Computer models, Rainfall, Solar radiation, Temperature, Winds, Humidity, Vegetation, Vegetation effects, Crops, Climatology, Meteorology.
Identifiers: *International Field Year for the Great Lakes.

A grid-square technique for calculating monthly evapotranspiration was developed in 1972 and tested in the Okanagan Basin of British Columbia. This method has been adapted to the Canadian land portion of the Lake Ontario Basin. The first step in the analysis is the tabulation of selected cover and physiographic characteristics for 136 grid areas of 400 sq km. Next, regression equations are obtained relating longer-term mean climatological data to cover and physiography. Grid area mean monthly values of precipitation, temperature and 'lake evaporation' (based on Class A pan network data) are then tabulated. Ratios of mean monthly evapotranspiration to mean lake evaporation, for various cover types, are postulated, based on other studies. Grid square values of mean monthly evapotranspiration are obtained. Iteration and optimization techniques can be applied to obtain 'best fit' fields of mean evapotranspiration and precipitation, consistent with mean runoff. Individual months of the International Field Year on the Great Lakes are then analyzed. Grid values of monthly 'deviations from normal' for the water balance variables are generated. The deviation fields are added to the normal fields to obtain monthly grid-area values of the water balance variables. These data can be used to generate monthly maps of 'lake evaporation', actual evapotranspiration, and other variables of interest. Results are compared at selected locations to estimates of evaporation obtained from the Thornthwaite and Penman methods. (See also W76-11275) (Sims - ISWS)
W76-11297

ASSESSMENT OF THE EFFECTS OF WASTE HEAT INPUTS ON WATER BUDGETS OF THE GREAT LAKES,
Acres Consulting Services, Ltd., Niagara Falls (Ontario).
For primary bibliographic entry see Field 5C.
W76-11305

PRELIMINARY ENERGY BUDGET OF LAKE ONTARIO FOR THE PERIOD MAY THROUGH NOVEMBER, 1972,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 2H.
W76-11433

RANDOM MODEL OF EVAPORATION OF OIL AT SEA,
Mathematica, Inc., Philadelphia, Pa.
For primary bibliographic entry see Field 5B.
W76-11462

A SIMPLE AND RAPID METHOD OF SOIL WATER DETERMINATION,
Himachal Pradesh Univ., Palampur (India). Coll. of Agriculture.
G. C. Aggarwal, and B. R. Tripathi.
Journal of Soil Science, Vol. 26, No. 4, p 437-439, December 1975. 1 tab, 2 ref.

Descriptors: *Soil water, *Soil texture, *Soil tests, *Moisture content, Soil density, Measurement, Instrumentation, Methodology.
Identifiers: *Pycnometers.

Soil water can be determined rapidly using a wide-mouthed pycnometer weighed after filling with a soil sample and a suitable amount of water. The particle density of the soil and weight of the water-filled pycnometer must be ascertained first; exact water volumes are unnecessary. Equations are provided for calculating the sample's dry weight and water content. This method gave water content values similar to those obtained by oven-drying when tested on seven soils varying in texture from sandy to silt clay loam, with pH from 5.8 to 8.2 and organic carbon from 0.14 to 1.35%. Water contents varied from 2.60 to 21.61 % by the oven-drying method and from 2.49 to 21.42% by the pycnometer method. This technique also takes into account the floating organic particles discarded in other methods, thus making it more suitable even for soils high in organic matter. (Jahns-Arizona)
W76-11506

SIMULATION OF THE WATER BALANCE OF SOIL COLUMNS AND FALLOW SOILS,
National Vegetable Research Station, Wellesbourne (England).
H. R. Rowse.
Journal of Soil Science, Vol. 26, No. 4, p 338-349, December 1975. 7 fig, 22 ref.

Descriptors: *Water balance, *Soil moisture, *Fallowing, *Evaporation, *Soil water movement, Soil dynamics, Soil types, Model studies, Flow, Diffusivity, Impact(Rainfall).

A model is described to predict water evaporation from and distribution in a soil column evaporating into a constant environment. The model is based on a numerical solution of the flow equation and requires only the column's initial water distribution, the equilibrium (air-dry) water content at the soil surface and the relationship between volumetric water content and diffusivity, the latter parameter being most important. Model predictions are in accord with a published analytical solution (Rose, 1968) and with experimental results. Water balance in a fallow field can be predicted with modifications to the model that allow for soil rewetting by rainfall and atmospheric changes above the soil. Since coarse sand had a distinct drying front, the method used to determine diffusivity was the main cause of disparity between the model and experimental results; sandy loam soils did not present this problem Generally good agreement was obtained with the measured distribution of water deficits in the soil profile. (Jahns-Arizona)
W76-11510

THE PRINCIPAL ASPECTS OF DESALINATION OF SURFACE WATERS OF THE TROPICAL SOUTHWESTERN PACIFIC, (IN FRENCH),
Office de la Recherche Scientifique et Technique Outre-Mer, Noumea (New Caledonia). Centre ORSTOM de Noumea.
J. R. Donguy, C. Henin, and F. Rougerie.
Cah O R S T O M Ser Oceanogr. 12(3), p 179-186, 1974.

Descriptors: *Desalination, *Pacific Ocean, *Advection, Rainfall, Salinity, Surface waters, Tropical regions, Evaporation, Evapotranspiration.
Identifiers: *Polynesia.

In the SW tropical Pacific, desalted water has 2 origins: the W Pacific Ocean and N of Polynesia. The desalted water is usually generated in areas where rainfall is strong, and then carried away by zonal advection; the desalted area N of Polynesia could also be supplied by meridian advection through the equator.--Copyright 1975, Biological Abstracts, Inc.
W76-11539

2E. Streamflow and Runoff

HYDROLOGIC ASPECTS OF FLOOD MANAGEMENT IN THE CHEMUNG RIVER BASIN,
Cornell Univ., Ithaca, N. Y. School of Civil and Environmental Engineering.
W. H. Brutsaert.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-256 211, $4.00 in paper copy, $3.00 in microfiche. Completion Report, Water Resources and Marine Sciences Center, Cornell University, Ithaca, New York, (1976). 32 p, 6 fig, 3 tab, 26 ref. OWRT A-060-NY(1). 14-31-0001-5032, 14-34-0001-6033.

Descriptors: *Flood forecasting, *Flood peak, *Rainfall-runoff relationships, *Unit hydrographs, *Runoff forecasting, Hydrologic systems, Management, River basins, *New York, Runoff, Streams, Watershed management, Model studies.
Identifiers: Chemung River basin(NY).

The process of watershed runoff resulting from extreme and complex flood-producing rainstorms was analyzed by the nonlinear systems approach. As an extension of the classical unit hydrograph method, a watershed system can be modeled in terms of a Volterra integral series. In this research the optimal identification of the first and second order unit response functions was carried out by means of data collected during major historical flood events on several watersheds of the Chemung River Basin. The basins selected were: Tioga River (Tioga, Pa.), Cowanesque River (Lawrenceville, Pa.), Tuscarora Creek (South Addison, N. Y.), Cohocton River (Campbell, N. Y.) and Newton Creek (Elmira, N. Y.). The response functions were determined by a Galerkin-type procedure in terms of an orthogonal expansion by means of Chebyshev polynomials. The resulting formulation was tested with available data from Tropical Storm Agnes of June 1972, which brought about the biggest flood in the history of the Susquehanna Basin. It was found that the nonlinear watershed model yields a better prediction of the hydrograph of an exceptional flood than the classical linear approach. The performance of any model is sensitive to the assumed rainfall loss rates.
W76-11106

PRELIMINARY INVESTIGATIONS OF A HEADWATER CREEK IN EASTERN KENTUCKY,
Virginia Commonwealth Univ., Richmond. Dept. of Biology.
For primary bibliographic entry see Field 5G.
W76-11284

STATISTICAL SUMMARIES OF INDIANA STREAMFLOW DATA,
Geological Survey, Indianapolis, Ind.
For primary bibliographic entry see Field 7C.
W76-11409

HYDROLOGIC DATA FOR URBAN STUDIES IN THE SAN ANTONIO, TEXAS METROPOLITAN AREA, 1974,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 7C.
W76-11413

INFORMATION TRANSFER FOR STREAM DISCHARGE,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7A.
W76-11499

SEDIMENT YIELD AS RELATED TO A STOCHASTIC MODEL OF EPHERMERAL RUNOFF,
Agricultural Research Service, Tucson, Ariz. Southwest Watershed Research Center.
For primary bibliographic entry see Field 2J.
W76-11512

INFLUENCE OF SIMPLIFICATIONS IN WATERSHED GEOMETRY IN SIMULATION OF SURFACE RUNOFF,
Agricultural Research Service, Tucson, Ariz.
For primary bibliographic entry see Field 2A.
W76-11517

2F. Groundwater

COMPUTER PROGRAM FOR THREE-DIMENSIONAL PLOTTINGS FROM IRREGULAR FINITE ELEMENT GRID,
California Univ., Davis. Dept. of Land, Air and Water Resources.
S. K. Gupta, M. W. Morrissey, J. Lonczak, and K. K. Tanji.
Available from the National Technecial Information Service, Springfield, Va 22161, as PB-256 568, $3.50 in paper copy, $3.00 in microfiche. Water Science and Engineering Papers 4010, March 1976, (California Water Resources Center Project UCAL-WRC-W-438)

Descriptors: *Computer programs, *Finite element analysis, Groundwater, Flow, *California, *Simulation analysis, Base flow, Aquifers, Model studies.
Identifiers: *Sutter Basin(Calif).

Three-dimensional plotting provides a means for interpretation and illustration of results and dynamic findings from finite element simulation. However, the computer graphic package as available at various computer centers requires data on a regular grid. It cannot be adopted for isoparametric finite elements since the elements are combinatiors of various shapes and sizes of trapezoids. Computer programs have been developed to interpolate the data from irregular finite element grid such that three-dimensional plottings can be generated to depict results from two or three dimensional finite element solution. The program developed has the option of generation of plots as viewed from various angles, varying number of contours and vertical scale. The capabilities of this program are illustrated by using specific examples of 3-D finite element solution of groundwater flow, Sutter Basin, California. (Snyder - California, Davis)
W76-11327

GROUND-WATER RESOURCES AND WATER USE IN SOUTHERN NAVAJO COUNTY, ARIZONA,
Geological Survey, Tucson, Ariz.
L. J. Mann.
Arizona Water Commission Phoenix, Bulletin 10, May 1976. 106 p, 6 fig, 4 plates, 6 tab, 24 ref, append.

Descriptors: *Groundwater resources, *Water quality, *Aquifer characteristics, *Hydrologic data, Water wells, Water utilization, Water supply, Water yield, Available water, Streamflow, Groundwater recharge, Water analysis, Chemical analysis, *Arizona.
Identifiers: Navajo County(Ariz).

The main source of water in the 3,400-square-mile area of southern Navajo County, Ariz., is the groundwater in storage in the Coconino aquifer, which underlies the entire area. About 76 percent of the water supply is from the Coconino aquifer, about 6 percent is from the Pinetop-Lakeside aquifer and from the alluvium along the large stream channels and flood plains, about 15 percent

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is from surface water, and about 3 percent is imported. Most groundwater withdrawn from the Coconino aquifer is for agricultural and industrial uses, and, in general, water levels have declined less than 5 feet. The sedimentary and basaltic rocks of the Pinetop-Lakeside aquifer supply water to the Pinetop-Lakeside recreational area, where the water in some wells has been polluted by sewage effluent. The water in the Pinetop-Lakeside aquifer is hydraulically separated from the water in the underlying sandstone Coconino aquifer. In general the groundwater in the southern part of the area is of good chemical quality; however, the water in the northern part of the area generally contains large concentrations of dissolved solids--mainly sodium, chloride, and bicarbonate. In the northernmost part of the area water in the Coconino aquifer is unsuitable for human or livestock consumption, irrigation, and most industrial uses. (Woodard-USGS)
W76-11410

GROUND-WATER RECORDS FOR NORTHEASTERN OKLAHOMA: PART 1--RECORDS OF WELLS, TEST-HOLES, AND SPRINGS,
Geological Survey, Oklahoma City, Okla.
For primary bibliographic entry see Field 7C.
W76-11412

FEASIBILITY OF MODELLING THE INFLUENCES OF PIT RECHARGE ON GROUND-WATER LEVELS AND QUALITY IN ALLUVIAL BASINS,
Water Resources Research Center, Tucson.
L. G. Wilson, W. O. Rasmussen, and D. F. O'Donnell.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-256 584, $4.50 in paper copy, $3.00 in microfiche. Completion Report, July 1976. 66 p, 19 fig, 11 tab, 28 ref, append. OWRT A-056-ARIZ(2). 14-31-0001-5003.

Descriptors: Finite element analysis, Water wells, *Artificial recharge, *Pit recharge, Hydraulic models, *Model studies, *Arizona, Water quality, Groundwater movement, Aquifers.
Identifiers: *Tucson basin(Ariz), *Finite difference models.

Specific objectives included (1) examining the effect of pit recharge, using industrial blowdown effluent, on local ground-water levels and quality in the Tucson basin; and (2) evaluaing the applicability of two digital models for modelling the hydraulic response of the aquifer to pumping and recharge. Fourteen pit trials ranging from 1 day to 185 days duration were imlemented during a two year period. The total volume of effluent recharged was 157 ac-ft. Pit recharge on a limited basis did not appear to offset the general decline in local ground-water levels. However, recharge deteriorated the quality of ground water in shallow (150 ft) wells but not in a deeper (300 ft) well. A finite difference (FD) model and a finite element model (FEM) were used to simulate hydraulic conditions in a 2000 ft by 2000 ft aquifer region near the pit. An attempt was made to calibrate the models using water level data from a two-week aquifer test on a shallow well. Results were depicted using a three-dimensional graphics technique (SYMVU). Better results were obtained with the FD model than with the FEM, primarily because a finer mesh was used to discretize the region with the FD model than with the FEM. Results of the FEM were also biased by the rectangular configuration of the aquifer boundary. The finite element model was used to simulate aquifer response during a pit recharge test. Again, results were limited by the injudicious selection of elements and boundary configurations.
W76-11487

PROCEEDINGS TENTH BIENNIAL CONFERENCE ON GROUND WATER, TOTAL WATER MANAGEMENT FOR CALIFORNIA'S LONG-RANGE NEEDS.
California State Dept. of Water Resources, Scramento.
For primary bibliographic entry see Field 4B.
W76-11491

PETROGRAPHIC AND GEOHYDROLOGIC MODEL OF AQUIFER LIMESTONES IN FLORIDA,
Florida Univ., Gainesville. Dept. of Geology.
A. F. Randazzo.
Available from the National Technical Information Service, Springfield, Va. 22161 as PB-256 761 $4.50 in paper copy, $3.00 in microfiche. Florida Water Resources Research Center, Gainesville, Publication No. 35, 1976. 51 p, 17 fig, 4 tab, 74 ref. OWRT A-025-FLA(3), 14-34-0001-6010.

Descriptors: *Groundwater movements, *Porosity, *Permeability, *Florida, *Model studies, *Petrography, Aquifer characteristics, *Dolomite, Magnesium, Lithologic logs, Diagenesis.

Petrographic analysis of 14 cores penetrating the Inglis and Avon Park Formations (Floridan Aquifer) reveals several distinct lithofacies representing multiple regressive-transgressive cycles, aerial exposure, and diagenesis. Evolution of pore spaces varies with lithofacies and a function of primary deposition and diagenetic history. The general tendency has been toward obliteration of primary voids by compaction and calcite and dolomite infilling, but several zones have experienced dissolution enlargement. There is evidence for penecontemporaneous dolomitization in supratidal environment, as well as post-depositional dolomitization by Mg-rich groundwater flushing. Various dolomite textures can be used to predict the environment of dolomitization. These textures are: (1) replacement dolomitization of the total sediment so that original fabrics are preserved; (2) dolomitization by aggrading neomorphic processes; and (3) replacement dolomitization of fossils and pellets only. The petrographic model presented, provides the framework into which the known geohydrologic and hydrochemical models can be integrated. (Morgan-Florida)
W76-11493

GEOPHYSICAL PROSPECTING FOR GROUND WATER IN ALASKA,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 4B.
W76-11496

MODELING SOLUTE TRANSPORT IN GROUND WATER,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 5B.
W76-11605

2G. Water In Soils

FRAGIPAN STABILITY IN SOIL-PLANT EFFLUENT DISPOSAL SYSTEMS,
Missouri Univ., Columbia. Dept. of Agronomy.
C. R. Edmonds, and R. W. Blanchar.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-256 228, $6.00 in paper copy, $3.00 in microfiche. Missouri Water Resources Research Center, Columbia, Completion Report, July 1, 1976. 133 p, 23 fig, 16 tab, 86 ref, append. OWRT A-087-MO(1), 14-34-0001-6026.

Descriptors: Effluents, *Hydraulic conductivity, *Soil strength, *Missouri, *Waste disposal, *Root development, Soil horizons, Soil profiles, *Acidity, *Bulk density, Lime, Root distribution, Root systems, Soil analysis.
Identifiers: *Fragipan horizon.

A large percentage of Ozark soils in Missouri possess a fragipan horizon. The fragipan restricts water movement and root growth in the profile. This study was conducted to evaluate the effect of changes in acidity and bulk density on the Hobson fragipan with respect to root growth and hydraulic conductivity. Chemical and physical tests associated with basic soil properties were conducted. Ion exchange relationships of six ion pairs, along with ion products of Fe, Al, and Mn hydroxides were examined. Hydraulic conductivity, probe penetration, and root growth experiments were conducted on reformed and natural samples of B2 and fragipan horizons. The rate of probe penetration had no effect on point resistance in reformed cores. Both acidity and high bulk density restrict root growth in the Hobson B2 and fragipan horizons. Data suggest low pH could induce Al toxicity in unlimed samples of both the B2 and fragipan soil. In reformed cores root growth was restricted at strengths between 10 and 20 bars, and greater strengths effectively stopped root growth. Strength of undisturbed B2 and fragipan cores was 20 to 25 bars and greater than 100 bars, respectively, at 0.33 bar moisture tension. No roots penetrated either core. The hydraulic conductivity of reformed cores was only slightly increased due to calcium oxide addition. Indications are the fragipan would remain stable with respect to roots and water movement unless it was physically modified. Profile modification would need to be supplemented with lime to effectively increase root distribution in the Hobson profile.
W76-11104

EFFECT OF DILUTED SEA WATER ON THE BASE STATUS OF AN ACID SOIL,
West Pakistan Agricultural Univ., Lyallpur. Dept. of Soil Sciences.
S. Muhammad.
Pak J Sci Res. 24(1/2), p 77-85, 1972.

Descriptors: *Sea water, *Acidic soils, Adsorption, Loam, Soil chemistry, Sodium, Magnesium, Leaching.

Columns of an acid Lauren loam soil were leached, with diluted sea water to study its effect on the exchangeable base status of the soil. One set of soil columns was leached with 33 acre-inches of SW/10 followed by 39 acre-inches of SW/1000 and the other set was leached with 33 acre-inches of SW/100 followed by 39 acre-inches of SW/1000. There were substantial gains in exchangeable Mg and Na and similar losses in Ca. The gains in H + Al increased with increasing initial base saturation of the soil. No soil column reached equilibrium with the leaching waters as indicated by continued adsorption of Mg by the soil and by differences in SAR (Na adsorption ratio) values of applied waters and ESP (exchangeable Na percentage) of the soil at the end of the experiment.--Copyright 1974, Biological Abstracts, Inc.
W76-11131

EFFECT OF TILLAGE SYSTEMS ON RUNOFF LOSSES OF PESTICIDES: A SIMULATED RAINFALL STUDY,
Iowa State Univ., Ames. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W76-11169

SOIL PROPERTIES AS AFFECTED BY TOPOGRAPHY IN DESERT WADIS,
Cairo Univ., Giza (Egypt). Faculty of Science.
K. H. Batanouny.
Acta Bot Acad Sci Hung. 19(1-4), p 13-21, 1973.

Descriptors: *Soil physical properties, Deserts, Africa, Physiography, Plant growth, *Soil depth, *Soil texture.
Identifiers: Topography, *Wadis.

Studies were carried out in one of the wadis of the Egypto-Arabian desert, namely wadi Hof near Helwan. The site studied was a part of the wadi, with numerous terraces and an irregular topography. Changes in the topography lead to the differentiation of a number of microhabitats spaced a few m apart. Each of them had their peculiar environmental conditions and plant cover. The soil properties, espececially texture and depth, played an important role in the plant life of the desert. This was mainly through through their controlling effect on the amount and availability of the water supply. It was shown that the soil properties varied widely in the different microhabitats. Such variation was referred to the topographic irregularities in the wadi. The physiographic features in a desert wadi, through their effect on the soil properties and in turn on the water resources, were the major factors affecting the distribution of the plant communities.--Copyright 1974, Biological Abstracts, Inc.
W76-11196

FALLOUT 137CS IN THE SOILS AND SEDIMENTS OF THREE SMALL WATERSHEDS,
Agricultural Research Service, Oxford, Miss. Sedimentation Lab.
For primary bibliographic entry see Field 5B.
W76-11453

RATIONALIZATION OF IONIC STRENGTH AND CATION EFFECTS ON PHOSPHATE SORPTION BY SOILS,
Massey Univ., Palmerston North (New Zealand). Dept. of Soil Science.
J. C. Ryden, and J. K. Syers.
Journal of Soil Science, Vol. 26, No. 4, p 395-406, December 1975. 2 tab, 4 fig, 23 ref.

Descriptors: *Phosphates, *Cations, *Cation adsorption, *Ion exchange, *Sorption, Soil chemistry, Soil dynamics, Kinetics, Isotherms, Soil investigations, Equilibrium.

Inorganic phosphate amounts sorbed by four contrasting unfertilized soils over a 40-hour period were influenced by the ionic strength and cation species of the contacting solution (support medium), as indicated by isotherms over the final P concentration range of 0 to 1 and 0 to 10 micro-g P/ml. P sorption was enhanced by increases in ionic strength, especially in support media with increasing Na or Ca concentrations. Sorption is also influenced by pH. Kinetic studies revealed that, within the P addition range used for each soil, equilibrium P concentration was independent of ionic strength and cation species; solution composition thus affected only the rate at which equilibrium was achieved. Results are due to the influence of ionic strength on the surface charge of retaining components and diffuse double layer thickness, along with effects of specific sorption of a divalent cation on surface charge, as they relate to P sorption rates. A support medium should reflect cation status as well as ionic strength of the system's aqueous phase. (Jahns-Arizona)
W76-11507

SIMULATION OF THE WATER BALANCE OF SOIL COLUMNS AND FALLOW SOILS,
National Vegetable Research Station, Wellesbourne (England).
For primary bibliographic entry see Field 2D.
W76-11510

EVOLUTION OF THE CATIONS INVOLVED IN RAIN, CANOPY LEACHATE AND DRAINAGE WATER THROUGH A FOREST ECOSYSTEM, (IN FRENCH),
Washington Univ., Seattle. Coll. of Forest Resources.
M. Rapp, and D. W. Cole.
Ann Sci For. 30(2), p 175-190, 1973.

Descriptors: *Cations, *Leachate, Drainage water, Forests, Ecosystems, Rainfall, Sodium, Calcium, Potassium, Soils, *Pacific Northwest U. S., Solubility, *Forest soils, Magnesium.

The change of Na, K, Ca and Mg in the precipitations after their penetration and transport through the soil was studied in a Douglas fir forest in Northwestern USA, by using tension lysimeters. The balance sheet of the 4 cations, moving in dissolved phase, was established for the whole ecosystem and the soil subsystem. The variations of the concentration of the soil solution at different depths was established. Some mechanisms are suggested for the solubility and for the transport of cations in forest soil. --Copyright 1974, Biological Abstracts, Inc.
W76-11540

DECREASE OF STRONTIUM-90 CONTENT IN THE TUNDRA SOIL-VEGETATION COVER, (IN RUSSIAN),
Ural Science Center, Sverdlovsk (USSR). Inst. of Plant and Animal Ecology.
For primary bibliographic entry see Field 2K.
W76-11565

2H. Lakes

A SURVEY OF THE PHYSICAL LIMNOLOGY OF GREAT SALT LAKE,
Utah Center for Water Resources Research, Logan.
A. Lin.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-256 210, $5.00 in paper copy, $3.00 in microfiche. Printed by Utah Division of Water Resources--Comprehensive Water Planning Program, Salt Lake City, (1976). 82 p, 18 fig, 1 tab, 22 ref, 3 append. OWRT A-029-UTAH(1). 14-31-0001-5045.

Descriptors: *Limnology, Lakes, Density flow, Seiches, Circulation, Mixing, *Stratification, Waves(Water), Diffusion, Currents(Water), Dispersion, Interfaces, *Great Salt Lake, *Utah, Surveys, Turbulent flow, Model studies.
Identifiers: *Lake currents, *Chemocline, *Physical limnology, Turbulent diffusion, Halocline oscillations.

This study summarizes some results of physical processes on the Great Salt Lake. Of some interest to limnologists is the meromixis (sustained two-layer stratification) in the south basin. The conspicuous two-layer was made possible by the presence of the railroad causeway. The stable stratification is demonstrated in the records of the last 15 years. The rate of entrainment of the chemocline obeys the general rules applicable to other large two-layer basins. The large-scale motion takes place more than 50 percent of the time. In the winter, the lake is calmer and most violent in late spring and early summer. The period of the fundamental surface wave was 6.0 hours on the record as compared to 5.43 hours obtained from a computation for the frictionless, rotationless Great Salt Lake. The discrepancy is accounted for by the effect of rotation and damping with a prognostic model. Time and space variations of the diffusion parameters are pronounced. The variation is attributable to the transient nature of the large-scale water movement frequently encountered, boundary influence from islands, spits or bars, and dynamics associated with the two-layer structure in the south basin. Oscillation of the halocline is substantial; typical period of oscillation is of the order of 35.0 hours, according to some preliminary field recordings.
W76-11107

UTILIZATION OF STREAM-BORNE PHOSPHORUS BY CAYUGA LAKE PHYTOPLANKTON,
Cornell Univ., Ithaca, N. Y.
For primary bibliographic entry see Field 5C.
W76-11108

VEGETATION MAPPING IN LAKE CHAMPLAIN WETLANDS,
Vermont Univ., Burlington. Dept. of Geography.
For primary bibliographic entry see Field 4A.
W76-11111

CHLORIDE MANAGEMENT IN LAKE ERIE BASIN,
State Univ. of New York at Buffalo. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W76-11114

RELATIONSHIP BETWEEN WATER QUALITY AND PLANT GROWTH IN PONDS,
Rutgers - The State Univ., New Brunswick, N. J. Dept. of Soils and Crops.
For primary bibliographic entry see Field 5C.
W76-11170

THE EFFECTS OF VARIATIONS IN TURBIDITY ON CYCLES OF PLANKTONIC AND BENTHIC ORGANISMS IN FLOOD CONTROL RESERVOIRS,
Mississippi Univ., Dept. of Biology.
For primary bibliographic entry see Field 5C.
W76-11172

LONG-TERM ACIDIFICATION OF A LAKE AND RESULTING EFFECTS ON FISHES,
Fisheries and Marine Service, Nanaimo (British Columbia). Biological Station.
For primary bibliographic entry see Field 5C.
W76-11178

SEASONAL MORTALITY OF RAINBOW TROUT (SALMO GAIRDNERI) PLANTED IN SMALLL EUTROPHIC LAKES OF CENTRAL CANADA,
Fisheries and Marine Service, Winnipeg (Manitoba). Freshwater Inst.
For primary bibliographic entry see Field 5C.
W76-11179

X-RAY DIFFRACTION AND ELECTRON BEAM ANALYSIS OF ASBESTIFORM MINERALS IN LAKE SUPERIOR WATERS,
National Water Quality Lab., Duluth, Minn.
For primary bibliographic entry see Field 5A.
W76-11248

PROCEEDINGS, SEVENTEENTH CONFERENCE ON GREAT LAKES RESEARCH, PART 1.
Proceedings of a Conference held August 12-14, 1974, McMaster University, Hamilton (Ontario). International Association for Great Lakes Research, Robert A. Sweeney, Treasurer, State University College, Great Lakes Laboratory, Buffalo, New York, 1974. 617 p.

Descriptors: *Great Lakes, *Limnology, *Water quality, *Biology, Aquatic life, Pollutants, Water pollution, Sediments, Sedimentation, Meteorology, Water temperature, Powerplants, Cooling water, Bacteria, Phytoplankton, Nutrients, Pesticides, Remote sensing, Model studies, Lakes.

The papers of this conference were grouped under the general headings of biology, geology/geochemistry, meteorology/hydrology, physical limnology, and water quality. A wide variety of research on the Great Lakes was reported. Many of the papers dealt with research related to the International Field Year for the Great Lakes (IFYGL), a North American contribution to the International Hydrologic Decade (IHD). The busi-

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ness meetings minutes, treasurer's report, bylaws, and membership list for the International Association for Great Lakes Research were included in this volume. (See W76-11276 thru W76-11324) (Sims - ISWS)
W76-11275

CRUSTACEAN ZOOPLANKTON OF SOUTHWESTERN LAKE ONTARIO IN 1972 DURING THE INTERNATIONAL FIELD YEAR FOR THE GREAT LAKES,
State Univ. Coll., Buffalo, N.Y. Great Lakes Lab.
S. C. Czaika.
In: Proceedings, Seventeenth Conference on Great Lakes Research, Part 1; McMaster University, Hamilton (Ontario), August 12-14, 1974. International Association for Great Lakes Research, p 1-16, 1974. 3 fig, 2 tab, 39 ref. EPA R800701.

Descriptors: *Zooplankton, *Crustaceans, *Lake Ontario, *Great Lakes, Aquatic animals, Aquatic life, Aquatic microorganisms, Copepods, Shellfish, Surveys, Sampling, Biomass, On-site investigations, Lakes, Biology, Limnology.
Identifiers: *International Field Year for the Great Lakes.

The sampling matrix had seven transects perpendicular to shore running from Port Weller to Rochester with three stations in each transect at 1/2, 4, and 8 km from shore. Sampling was conducted during ten cruises from mid-April to mid-December, 1972. Copepod nauplii were the most abundant identification group followed by bosminids with mucro and immature cyclopoid copepodids. The other common identification groups in decreasing order of abundance were Daphnia retrocurva, Ceriodaphia lacustris, Cyclops biscuspidatus thomasi, Tropocyclops prasinus mexicanus, immature calanoid copepodids, and Eubosmina coregoni. With the exception of E. coregoni, these groups peaked in September and October. The common cladocerans exhibited the typical cladoceran pattern of winter and spring absence followed by very high maxima in late summer and early fall, especially closest to shore. Several species were encountered which have not been reported previously from Lake Ontario. Among these are perhaps three species of Alona, Camptocercus rectirostris, Eurycercus lamellatus, a species of Eucyclops, and five species of harpacticoid copepods (Bryocamptus nivalis, Canthocamptus robertcokeri, Canthocamptus staphylinoides, Mesochra alaskana, Moraria cristata). (See also W76-11275) (Sims-ISWS)
W76-11276

VERTICAL INTERACTIONS IN PHYTOPLANKTON POPULATIONS - AN ASYMPTOTIC EIGENVALUE ANALYSIS,
Manhattan Coll., Bronx, N.Y. Environmental Engineering and Science Graduate Program.
D. M. DiToro.
In: Proceedings, Seventeenth Conference on Great Lakes Research, Part 1; McMaster University, Hamilton (Ontario), August 12-14, 1974. International Association for Great Lakes Research, p 17-27, 1974. 11 fig, 15 ref, 1 append. EPA R800610.

Descriptors: *Phytoplankton, *Plant populations, *Model studies, *Great Lakes, Aquatic populations, Aquatic plants, Biomass, Growth rates, Mathematical models, Analytical techniques, Buoyancy, Dispersion, Settling velocity, Lakes, Biology, Limnology.
Identifiers: *International Field Year for the Great Lakes.

An analysis of the one-dimensional vertical phytoplankton biomass equation indicated that if the population biomass is increasing, then asymptotically the log growth rate of the population will approach a value independent of depth. An examination of data from four bodies of water supported this theoretical prediction. For constant spatial variations of the parameters with the exception of an exponentially decreasing growth rate, the asymptotic growth rate of the population is related to the important dimensionless parameter groups. In particular, settling velocity effects were examined, together with their interactions with vertical dispersion, and euphotic zone depth. The results were presented in a series of dimensionless plots. (See also W76-11275) (Sims ISWS)
W76-11277

THE CRUSTACEAN ZOOPLANKTON OF GREEN BAY, LAKE MICHIGAN,
Wisconsin Univ., Milwaukee. Center for Great Lakes Studies
J. E. Gannon
In: Proceedings, Seventeenth Conference on Great Lakes Research, Part 1; McMaster University, Hamilton (Ontario), August 12-14, 1974. International Association for Great Lakes Research, p 28-51, 1974. 10 fig, 1 tab, 42 ref

Descriptors: *Zooplankton, *Crustaceans, *Bays, *Lake Michigan, *Great Lakes, Copepods, Aquatic life, Aquatic animals, Aquatic microorganisms, Rivers, Water pollution, Pollutants, Nutrients, Biomass, Surveys, Sampling, On-site investigations, Biology, Limnology.
Identifiers: *Green Bay(Wis).

Crustacean zooplankton were investigated in Green Bay during 1969-70. Thirty-four limnetic species and 12 littoral species were collected. Zooplankton community structure is similar in northern Green Bay, Little and Big Bay de Noc, and Lake Michigan. However, the zooplankton community is substantially different in southern Green Bay. The southeastern portion of the bay is strongly influenced by the inflow of nutrient-laden waters of the Fox River. Standing crop of zooplankton is generally higher in the zone of Fox River influence. Many species common in the plankton of Lake Winnebago are transported through the Fox River and have established populations in southern Green Bay. Many of these species are rare or absent elsewhere in the Lake Michigan basin. Many large species that have become rare in Lake Michigan in recent years due to size-selective predation by alewife are still abundant in Green Bay. The impact of fish predation by alewife and smelt on the larger zooplankton species appears to be buffered by recruitment of these zooplankters into the population both from higher rates of production in the eutrophic Green Bay waters and from dispersal of individuals into Green Bay from Lake Winnebago by way of the Fox River. (See also W76-11275) (Sims-ISWS)
W76-11278

DIELDRIN AND DDT: ACCUMULATION FROM WATER AND FOOD BY LAKE TROUT (SALVELINUS NAMAYCUSH) IN THE LABORATORY,
Bureau of Commercial Fisheries, Ann Arbor, Mich. Great Lakes Fishery Lab.
For primary bibliographic entry see Field 5C.
W76-11279

LABORATORY ESTIMATES OF THE SEASONAL FINAL TEMPERATURE PREFERENDA OF SOME LAKE ERIE FISH,
Ohio State Univ., Put-in-Bay. Center for Lake Erie Area Research.
J. M. Reutter, and C. E. Herdendorf.
In: Proceedings, Seventeenth Conference on Great Lakes Research, Part 1; McMaster University, Hamilton (Ontario), August 12-14, 1974. International Association for Great Lakes Research, p 59-67, 1974. 3 fig, 1 tab, 11 ref.

Descriptors: *Fish behavior, *Water temperature, *Thermal pollution, *Lake Erie, Temperature, Seasonal, Fish, Laboratory tests, Powerplants, Water pollution, Environmental effects, Lakes, Environmental effects, Biology.
Identifiers: *Water temperature preference.

Since June 1971, Ohio State University, in cooperation with the Ohio Department of Health and the U.S. Bureau of Sport Fisheries and Wildlife, has conducted experiments to determine the seasonal final temperature preferenda (Cont'd 5C)

Lake Erie fish of 24 species. Temperature preferenda ability were measured in a horizontal temperature gradient tank, seasonal by species season, and age. Fish were held at the temperature prior to testing. All species tested preferred temperatures above lake temperatures during fall, winter and spring. Summer temperature preferenda were approximately equal to or slightly higher than lake temperatures. Exceptions were necessary to fall, winter and spring values for species tested would have to be acclimated to warmer than they could tolerate in the wild. (See also W76-11275) (Sims ISWS)
W76-11280

MIGRATORY BEHAVIOR OF FISH TAGGED AT A NUCLEAR POWER PLANT DISCHARGE INTO LAKE MICHIGAN,
Argonne National Lab., Ill. Radiological and Environmental Research Div.
G. P. Romberg, S. A. Spigarelli, W. Prepejchal, and M. M. Thommes
In: Proceedings Seventeenth Conference on Great Lakes Research, Part 1; McMaster University, Hamilton (Ontario), August 12-14, International Association for Great Lakes Research, p 68-77, 1974. 6 fig, 3 tab, 14 ref

Descriptors: *Fish behavior, *Fish migration, *Thermal pollution, *Lake Michigan, Temperature, Water temperature, Fish, Freshwater fish, Trout, Lake trout, Salmon, Tagging, Environmental effects, Powerplants, Water pollution, Biology.
Identifiers: *Water temperature preference.

With the proliferation of nuclear power plants on Lake Michigan, much concern has been expressed over the effects of plume 'residence' and abnormal temperature exposures on the physiology and migratory behavior of important fish species. A mark and recapture study was conducted at the Point Beach Nuclear Plant to describe the migratory behavior of fish at this thermal discharge. A total of 1781 fish (7 species) were captured, tagged and released during 1972 and 1973. As of August 1, 1974, 14% of the tagged fish were recaptured, primarily by sport fisherman. Eighty-four percent of the recaptures by fishermen occurred at locations other than Point Beach, and the number or recaptures generally decreased with distance. Rainbow trout tended to be the most migratory, but individuals of each species showed extensive movements. Experimental temperature-sensitive fish tags indicated that the majority of fish recaptured at Point Beach spent less than 10% of their time at discharge temperature. Brown trout exhibited a stronger attraction to discharge waters than did rainbow trout or chinook salmon. High percentages of recapture for most species suggest negligible mortalities due to plume 'residence' or the tagging procedure and imply that Lake Michigan sport fishermen are annually harvesting a substantial proportion of the fish stocks. (See also W76-11275) (Sims - ISWS)
W76-11281

STORM INDUCED RELATIONSHIPS AMONG CHEMICAL CONDITIONS AND PHYTOPLANKTON IN SAGINAW BAY AND WESTERN LAKE HURON,
Michigan Univ., Ann Arbor. Great Lakes Research Div.
For primary bibliographic entry see Field 5C.
W76-11282

CHANGES IN PHYTOPLANKTON FOLLOWING NITRATE PHOSPHATE ADDITIONS TO LARGE ENCLOSURES IN MARION LAKE, BRITISH COLUMBIA,
Ottawa Univ. (Ontario). Dept. of Biology.
For primary bibliographic entry see Field 5C.
W76-11283

TEMPORAL AND SPATIAL DISTRIBUTIONS OF PLANKTONIC ROTIFERS IN MILWAUKEE HARBOR AND ADJACENT LAKE MICHIGAN,
Wisconsin Univ., Milwaukee. Center for Great Lakes Studies.
R. S. Stemberger.
In: Proceedings, Seventeenth Conference on Great Lakes Research, Part 1; McMaster University, Hamilton (Ontario), August 12-14, 1974. International Association for Great Lakes Research, p 120-134, 1974. 16 fig, 1 tab, 24 ref.

Descriptors: *Rotifers, Harbors, *Lake Michigan, *Great Lakes, Plankton, Zooplankton, Sampling, Surveys, Seasonal, Spatial distribution, Benthic fauna, Temperature, Epilimnion, Biology, Limnology.
Identifiers: *Milwaukee(Wis).

Twenty-nine species of limnetic rotifers were prominent in the open waters off Milwaukee, Wisconsin, July 1972 to June 1973. Nine additional species were of rare or solitary occurrence. Eleven limnetic species were recorded for the first time in Lake Michigan. The predominant genera were Polyarthra, Keratella, Synchaeta and Notholca. Significant inshore-offshore differences in abundance and species composition were observed. The rotifer community in Milwaukee Harbor was composed mainly of benthic and littoral species as well as limnetic species characteristic of eutrophic waters. Pronounced vertical differences in distribution of species existed during thermal stratification. Rotifers were distributed during the late morning hours predominantly in the lower depths of the epilimnion and in the vicinity of the metalimnion. Currents and turbulence generated during high winds can distribute rotifers more uniformly throughout the epilimnion. The seasonal abundance of rotifers appears trimodal with two major peaks in July and September and a minor one in October. (See also W76-11275) (Sims - ISWS)
W76-11285

MODELING OF PHYTOPLANKTON IN LAKE ONTARIO,
Manhattan Coll., Bronx, N. Y. Environmental Engineering and Science.
For primary bibliographic entry see Field 5C.
W76-11286

PLUTONIUM DISTRIBUTION IN LAKE MICHIGAN BIOTA,
Argonne National Lab., Ill. Radiological and Environmental Research Div.
E. M. Yaguchi, B. J. Waller, and J. S. Marshall.
In: Proceedings, Seventeenth Conference on Great Lakes Research, Part 1; McMaster University, Hamilton (Ontario), August 12-14, 1974. International Association for Great Lakes Research, p 150-157, 1974. 3 fig, 2 tab, 22 ref.

Descriptors: *Biota, *Radioisotopes, *Lake Michigan, Surveys, Sampling, Food chains, Water pollution, Pollutants, Analytical techniques, Nuclear wastes, Radioactive wastes, Plankton, Zooplankton, Phytoplankton, Algae, Benthic fauna, Fish, Chemistry, Biology, Limnology.
Identifiers: *Plutonium.

Samples of plankton, algae, benthic invertebrates, and eight fish species were collected from Lake Michigan during 1972 and 1973. After ashing, the samples were analyzed by radiochemical methods and gamma-ray spectrometry for Pu239, Sr90, and Cs137, all of which are components of fallout from atmospheric tests of nuclear weapons. Analyses indicated that Pu239 was scavenged from Lake Michigan water by phytoplankton and attached algae with a concentration factor of up to 10,000. In each of two food chains considered, a progressive discrimination against Pu239 was observed at successive trophic levels: (1) phytoplankton to zooplankton to planktivorous fish to piscivorous fish, and (2) benthic invertebrates to bottom-feeding fish. The benthic invertebrates and fish had somewhat higher Pu239 concentrations than their pelagic counter-parts, presumably because of their ingestion of sediments. Ash content was correlated with Pu239 concentrations in samples of plankton and fish. (See also W76-11275) (Sims - ISWS)
W76-11287

PHOSPHORUS MOBILITY IN LAKE ONTARIO SEDIMENTS,
Wisconsin Univ., Madison. Water Chemistry Lab.
For primary bibliographic entry see Field 5B.
W76-11288

THE STRATIGRAPHY OF NORTHERN LAKE SUPERIOR LATE-GLACIAL AND POSTGLACIAL SEDIMENTS.
Canada Centre for Inland Waters, Burlington (Ontario),
For primary bibliographic entry see Field 2J.
W76-11289

GROYNE STABILIZATION OF SLOPE MOVEMENTS AND TOE EROSION, LAKE HURON NEAR BAYFIELD, ONTARIO,
University of Western Ontario, London. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W76-11290

BIOLOGICAL TRANSFORMATION OF CLAY-SIZED SEDIMENTS IN SIMULATED AQUATIC ENVIRONMENTS,
Guelph Univ. (Ontario), Dept. of Land Resource Science.
For primary bibliographic entry see Field 2J.
W76-11291

STUDIES OF PLUTONIUM CYCLING AND SEDIMENTATION IN LAKE MICHIGAN,
Argonne National Lab., Ill. Radiological and Environmental Research Div.
For primary bibliographic entry see Field 5B.
W76-11292

OCCURRENCE OF AS, CD, CO, CR, CU, FE, HG, NI, SB, AND ZN IN LAKE ERIE SEDIMENTS,
Bowling Green State Univ., Ohio. Dept. of Geology.
For primary bibliographic entry see Field 5B.
W76-11293

POLLUTANT MERCURY AND SEDIMENTATION IN THE WESTERN BASIN OF LAKE ERIE,
Bowling Green State Univ., Ohio. Dept. of Geology.
For primary bibliographic entry see Field 5B.
W76-11294

THE RADIATION BUDGET OF LAKE ONTARIO,
Center for the Environment and Man, Inc., Hartford, Conn.
M. A. Atwater.
In: Proceedings, Seventeenth Conference on Great Lakes Research, Part 1; McMaster University, Hamilton (Ontario), August 12-14, 1974. International Association for Great Lakes Research, p 250-258, 1974. 9 fig, 3 tab, 8 ref. NOAA 2-35353, NSF GA-31296.

Descriptors: *Model studies, *Radiation, *Lake Ontario, Solar radiation, Infrared radiation, Heat budget, Albedo, Mathematical models, Computer models, Clouds, Water vapor, Carbon dioxide, On-site data collections, Atmosphere, Meteorology.
Identifiers: *International Field Year for the Great Lakes, *Radiation budget, Net radiation.

A horizontal array of 30 grid points was used to compute the radiation budget for Lake Ontario during the International Field Year of the Great Lakes (IFYGL). A weighted-average analysis method computed meteorological variables, including cloud amounts, at each grid point from surface observations. The radiation model was designed for accuracy, economy, efficiency and the inclusion of major physical processes that alter radiative fluxes. Downward and upward solar and infrared radiative fluxes were computed utilizing empirical transmission functions for absorbers, scatterers, and clouds. Observations taken during IFYGL were compared with time-integrated numerical results at selected sites. The differences are analyzed and changes in the numerical model were described. Results were presented for the net radiation balance for Lake Ontario during IFYGL and were compared with results based on observations. (See also W76-11275) (Sims - ISWS)
W76-11295

A STUDY OF LAKE-LAND BREEZE CIRCULATION OVER LAKE ONTARIO FROM IFYGL BUOY OBSERVATIONS,
National Oceanic and Atmospheric Administration, Washington, D. C. Center for Experiment Design and Data Analysis; and National Oceanic and Atmospheric Administration, Washington, D. C. Environmental Data Service.
J. K. S. Ching.
In: Proceedings, Seventeenth Conference on Great Lakes Research, Part 1; McMaster University, Hamilton (Ontario), August 12-14, 1974. International Association for Great Lakes Research, p 259-268, 1974. 10 fig, 2 tab, 6 ref.

Descriptors: *Lake breezes, *Land breezes, *Air circulation, *Lake Ontario, Diurnal, Winds, Buoys, Temperature, Water temperature, Lakes, Atmosphere, Limnology, Meteorology.
Identifiers: *International Field Year for the Great Lakes, Divergence, Vorticity.

Data from both the United States and Canadian meteorological buoys were classified and averaged in terms of proximity to the northern, middle, and southern trisections of Lake Ontario. The diurnal variation of the averaged v wind component for these trisections was computed for a two week period in July 1972. A significant diurnal variation was found in all three cases, with the largest amplitude in the southern region. After subtracting the variations of the flow in the middle of the lake, which was assumed attributable to other scales of motion, from the northern and southern variations, a lake-land breeze circulation became apparent. The flow in the northern and southern sectors were almost in phase, of about equal magnitude (about 3/4 m/sec), and of opposite sign. The changes from land-to-lake and lake-to-land breeze occur at 10 a.m. and 10 p.m. local time, respectively. The variations in the computed vorticity, divergence, and curl of surface stress attributed to lake-land breeze circulation were discussed. (See also W76-11275) (Sims - ISWS)
W76-11296

MONTHLY EVAPOTRANSPIRATION ESTIMATES FOR THE CANADIAN LAND PORTION OF THE LAKE ONTARIO BASIN DURING THE IFYGL,
Atmospheric Environment Service, Downsview (Ontario), Hydrometeorology and Environmental Impact Research Div.

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For primary bibliographic entry see Field 2D.
W76-11297

TURBULENT KINETIC ENERGY BALANCE NEAR THE FROZEN SURFACE OF EASTERN LAKE ONTARIO,
York Univ., Downsview (Ontario). Dept. of Physics.
C. S. Maddukuri, and W. R. Frisken.
In: Proceedings, Seventeenth Conference on Great Lakes Research, Part 1; McMaster University, Hamilton (Ontario), August 12-14, 1974. International Association for Great Lakes Research, p 288-295, 1974. 3 fig, 2 tab, 32 ref.

Descriptors: *Energy budget, *Energy transfer, *Ice, *Lake Ontario, Stability, Turbulence, Anemometers, Ice cover, Surfaces, Boundary layers, Lakes, Heat, Heat flow, Heat balance, Atmosphere, Meteorology, On-site investigations.
Identifiers: *International Field Year for the Great Lakes, Kinetic energy, Energy balance.

During February and March of 1973, direct measurements were made of turbulent fluxes of momentum and heat in the boundary layer using an ultrasonic anemometer mounted 2.67 m above the ice surface. These data were used to compute the kinetic energy balance in the boundary layer over the frozen water surface of Lake Ontario. Integrated statistics obtained in this study showed that the nature of the turbulence is similar to that observed at other sites over land and water. However, a plot of ratio of the variances of vertical and longitudinal velocity fluctuations against the stability parameter did not show any rapid transition as stability changes from stable to unstable. The values of various terms in the equation for the turbulent kinetic energy budget computed from the data were significantly less than those reported for studies over land and water surfaces. This is due to the smoothness of the ice surface and the light winds prevailing during the experiment. For nearly neutral conditions, the local production of turbulent energy is balanced by the local dissipation, in agreement with others. For unstable and slightly stable conditions the dissipation is not balanced by production. Very stable cases were not considered because of considerable anisotropy. (See also W76-11275) (Sims - ISWS)
W76-11298

IFYGL WEATHER HIGHLIGHTS,
Atmospheric Environment Service, Toronto (Ontario). Lake and Marine Applications Section.
For primary bibliographic entry see Field 2B.
W76-11299

GREAT LAKES TEMPERATURE MAPS BY SATELLITE,
National Environmental Satellite Service, Washington, D. C.
A. E. Strong.
In: Proceedings, Seventeenth Conference on Great Lakes Research, Part 1; McMaster University, Hamilton (Ontario), August 12-14, 1974. International Association for Great Lakes Research, p 321-333, 1974. 14 fig, 8 ref.

Descriptors: *Remote sensing, *Temperature, *Great Lakes, Satellites(Artificial), Maps, Lake, Ice, Ice cover, Clouds, Water temperature, Infrared radiation, Instrumentation, Limnology.
Identifiers: *International Field Year for the Great Lakes, NOAA-2, *Temperature maps(Lakes).

Five case studies using Very High Resolution Radiometer data from the NOAA-2 satellite were presented. They demonstrated a capability for monitoring surface temperatures of the Great Lakes from space. Comparisons of this data with data available from more conventional sources were used to illustrate: (1) isothermal conditions, (2) thermal-bar circulations, (3) diurnal variability, and (4) summer upwelling. Examples presented showed the potential for using satellite observations routinely to monitor surface temperatures of the Great Lakes. (See also W76-11275) (Sims - ISWS)
W76-11300

SELECTED SATELLITE DATA ON SNOW AND ICE IN THE GREAT LAKES BASIN 1972-73,
National Environmental Satellite Service, Washington, D. C.
For primary bibliographic entry see Field 2C.
W76-11301

NEARSHORE CURRENTS AND WATER TEMPERATURES ALONG THE NORTH SHORE OF LAKE ONTARIO BETWEEN PICKERING AND COBOURG,
Ontario HYDRO, Toronto. Hydraulic Studies Dept.
A. A. Arajs, and R. Farooqui.
In: Proceedings, Seventeenth Conference on Great Lakes Research, Part 1; McMaster University, Hamilton (Ontario), August 12-14, 1974. International Association for Great Lakes Research, p 348-357, 1974. 10 fig, 2 tab, 3 ref.

Descriptors: *Currents(Water), *Water temperature, *Lake Ontario, *Great Lakes, Buoys, Current meters, Temperature, Lakes, Winds, Shores, On-site investigations, On-site data collections, Surveys, Sampling, Limnology.
Identifiers: *International Field Year for the Great Lakes.

In 1972 as part of Ontario Hydro's contribution to IFYGL and also in continuation of its hydrologic and environment studies, a program of lake current and water temperature measurements was carried out at four sites along a 100 km stretch of the north shore of Lake Ontario between Toronto and Cobourg. Current and temperature recorders were installed at various depths within a band of 2 km offshore and maintained from April to November. Results indicated that water movement was predominantly longshore all locations. Resultant transport was westward at all sites, except Pickering. Maximum current speeds were in the order of 30 cm/sec. Water temperatures indicated similarity at all sites; surface warming in spring, complete stratification including up- and down-welling in summer, and isothermal conditions in fall. (See also W76-11275) (Sims - ISWS)
W76-11302

POINT PETRE STORM SURGES SIMULATION,
Department of the Environment, Ottawa (Ontario). Marine Environmental Data Service; and Department of the Environment, Ottawa (Ontario). Ocean and Aquatic Affairs.
P-A. Bolduc.
In: Proceedings, Seventeenth Conference on Great Lakes Research, Part 1; McMaster University, Hamilton (Ontario), August 12-14, 1974. International Association for Great Lakes Research, p 358-368, 1974. 11 fig, 3 ref.

Descriptors: *Model studies, *Storm surge, *Lake Ontario, Mathematical models, Statistical models, Winds, Wind velocity, Wind tides, Surges, Waves(Water), Seiches, Water levels, Water level recorders, Water level fluctuations, Limnology.
Identifiers: *Point Petre(Ontario).

Frequency distribution of water level differences between on shore and off shore measurements were illustrated and analyzed from July to December 1971 for Point Petre on Lake Ontario. The technique enabled a quality check on the off shore water level measurement, the critical part of the data. Positive differences between the on shore and off shore measurements suggested water level set-up during storm activities. Six different storm periods (A through F) were presented. Correlation of the wind with the resultant water level difference was quite high (minimum value being 0.72). Using storm A for calibration, two different models were proposed to simulate the water set-up from the wind data for storms B through F. The first model is a mathematical model. The largest and smallest root mean square value of the differences between the observed and predicted set up for this type of model were respectively 0.087 m for storm B and 0.050 m for storm F. The second model is a statistical model based on linear regression. A polynomial equation of the sixth order was defined from storm A. The fit between the observed and predicted water level differences (set up) for the five storms was improved using the polynomial equation. The maximum and minimum root mean square values were 0.061 m for storm C and 0.039 m for storm D. The type of phenomenon observed at Point Petre suggests that on shore water level measurements do not give a real picture of the mean water level of the lake (a value used for regulation) during storm activities, the build-up of the water being mainly a shore process. (See also W76-11275) (Sims - ISWS)
W76-11303

GENERALIZED PROFILES OF WIND SPEED, TEMPERATURE AND HUMIDITY,
Canada Centre for Inland Waters, Burlington (Ontario).
M. A. Donelan, K. N. Birch, and D. C. Beesley.
In: Proceedings, Seventeenth Conference on Great Lakes Research, Part 1; McMaster University, Hamilton (Ontario), August 12-14, 1974. International Association for Great Lakes Research, p 369-388, 1974. 14 fig, 16 ref.

Descriptors: *Wind velocity, *Temperature, *Humidity, *Lake Ontario, Measurement, Instrumentation, Towers, Winds, Air temperature, On-site investigations, On-site data collections, Data processing, Analytical techniques, Lakes, Shores, Atmosphere, Stability, Boundary layers, Meteorology.
Identifiers: *Over-water measurements, Wind profiles, Temperature profiles.

Throughout the four boundary layer active periods of the IFYGL, ten minute averaged profiles were measured from a tower off Niagara-on-the-Lake. This paper described the measurement system and summarized the profiles by a set of non-dimensional functions of stability which would allow one to construct profiles knowing only the air-water differences of the three primary stability determining paramenters: wind speed, temperature and humidity. (See also W76-11275) (Sims - ISWS)
W76-11304

ASSESSMENT OF THE EFFECTS OF WASTE HEAT INPUTS ON WATER BUDGETS OF THE GREAT LAKES,
Acres Consulting Services, Ltd., Niagara Falls (Ontario).
For primary bibliographic entry see Field 5C.
W76-11305

HELMHOLTZ RESONANCE IN HARBOURS OF THE GREAT LAKES,
Canada Centre for Inland Waters, Burlington (Ontario).
N. G. Freeman, P. F. Hamblin, and T. S. Murty.
In: Proceedings, Seventeenth Conference on Great Lakes Research, Part 1; McMaster University, Hamilton (Ontario), August 12-14, 1974. International Association for Great Lakes Research, p 399-411, 1974. 9 fig, 1 tab, 9 ref.

Descriptors: *Resonance, *Harbors, *Model studies, *Great Lakes, Waves(Water), Mathematical models, Analytical techniques, Lakes, Bays, Hydrodynamics, Hydraulics, Limnology.
Identifiers: *Helmholtz resonance.

Helmholtz resonance basically represents the balance between the kinetic energy of the water

flowing in through a narrow connecting channel, and the potential energy from the rise in mean water level within the harbor. It is an additional gravitational mode of substantially longer period than fundamental free oscillation and can be significant in the contamination of spectra of water levels collected in harbors and in the consideration of harbor flushing times. Theoretical estimates for the Helmholtz periods for an idealized multi-channel basin were computed by means of a multi-degree of freedom resonator and for a more realistic geometry by means of a numerical model. Power spectral analysis of water level records measured during the IFYGL study compared favorably with the theoretical predictions for the Toronto and Hamilton harbors. The Helmholtz resonator model is less satisfactory in dealing with bays with complicated entrance geometry, and it was demonstrated that a co-oscillation model is more appropriate. (See also W76-11275) (Sims - ISWS)
W76-11306

FIELD OBSERVATIONS OF THE DYNAMICS OF HEATED DISCHARGE JETS,
Argonne National Lab., Ill. Energy and Environmental Systems Div.
For primary bibliographic entry see Field 5B.
W76-11307

VERTICAL MIXING CHARACTERISTICS IN THE THERMOCLINE AND HYPOLIMNION REGIONS OF LAKE ONTARIO,
Copenhagen Univ., Denmark. Inst. of Physical Oceanography.
G. Kullenberg, C. R. Murthy, and H. Westerberg.
In: Proceedings, Seventeenth Conference on Great Lakes Research, Part 1; McMaster University Hamilton (Ontario), August 12-14, 1974. International Association for Great Lakes Research, p 425-434, 1974. 7 fig, 2 tab, 20 ref.

Descriptors: *Mixing, *Thermocline, *Hypolimnion, *Lake Ontario, Tracer, Dye releases, Fluorescent dye, Temperature, Water temperature, Energy dissipation, Lakes, On-site investigations, Hydrodynamics, Limnology.
Identifiers: *International Field Year for the Great Lakes, Vertical mixing.

The instantaneous point-source, sub-surface dye diffusion experiments carried out during the IFYGL were used to study the small-scale vertical mixing in relation to the vertical temperature and current structure. The experiments covered time scales from 5 to 80 hours as well as a wide range of environmental conditions. In the vertical direction, the dye distribution exhibited a layered structure which apparently is related to the density and current structures in the water column. Several types of dye layers were observed. The close relation between the dye distribution and the small-scale temperature structure was shown, and possible layer generating mechanism were discussed, such as advective processes, wave generated overturning instabilities, and shear instabilities. The effective vertical mixing coefficient, as determined by means of the dye profiles, was found to vary considerably. It falls in the range 0.01.5 sq cm/sec. The persistency of the dye layers alone shows that the mixing can be extremely weak. The results also suggested that the mixing depends upon the density stratification, the vertical current shear, and the fluctuating kinetic energy. A relationship to this effect was suggested based on Lake Ontario and oceanic data. The energy dissipation per unit mass and time was estimated by means of the dye profiles at depths around 30 m. It was found to be of the order of 0.000061 sq cm/sec to the 3rd power. This value is one to two orders of magnitude smaller than values reported from corresponding depths in the ocean. (See also W76-11275) (Sims - ISWS)
W76-11308

DURATION-LIMITED WAVE SPECTRA IN LAKE ONTARIO DURING THE 1972 HURRICANE AGNES,
National Oceanic and Atmospheric Administration, Ann Arbor, Mich. Great Lakes Environmental Research Lab.
P. C. Liu.
In: Proceedings, Seventeenth Conference on Great Lakes Research, Part 1; McMaster University, Hamilton (Ontario), August 12-14, 1974. International Association for Great Lakes Research, p 435-444, 1974. 7 fig, 6 ref.

Descriptors: *Waves(Water), *Hurricanes, *Lake Ontario, Winds, Wind velocity, Wind tides, Buoys, On-site investigations, Measurement, Lakes, Energy, Storms, Limnology.
Identifiers: *Hurricane Agnes, Wave spectra, Waverider buoys.

Analyses of hourly wave spectra during the hurricane Agnes, 22-23 June 1972, from two waverider recordings at Oswego-1 and Oswego-2 buoys in Lake Ontario showed that the growth and decay of significant wave heights follow in approximately linear pattern with time during respectively increasing and decreasing wind speed. An initial growth of wave spectra from a relatively calm condition is quite rapid and abrupt and the growth rate is not linear. The development of individual spectral components can be grouped into three spectral ranges: low frequency range where the components are most sensitive to wind, a high frequency range where the components are generally independent of time or wind stress, and a middle frequency range possesses both high and low frequency range properties. (See also W76-11275) (Sims - ISWS)
W76-11309

A NUMERICAL MODEL FOR THERMAL PLUMES AND RIVER DISCHARGES,
Case Western Reserve Univ. Cleveland, Ohio. Dept. of Earth Sciences.
For primary bibliographic entry see Field 5B.
W76-11310

VERTICAL MOTIONS ALONG THE NORTH SHORE OF LAKE SUPERIOR,
Wisconsin Univ., Madison. Marine Studies Center.
R. A. Ragotzkie.
In: Proceedings, Seventeenth Conference on Great Lakes Research, Part 1; McMaster University, Hamilton (Ontario), August 12-14, 1974. International Association for Great Lakes Research, p 456-461, 1974. 3 fig, 1 tab, 5 ref.

Descriptors: *Upwelling, *Lake Superior, *On-site investigations, Measurement, Currents(Water), Temperature, Water temperature, Lakes, Winds, Shores, Coasts, Circulation, Water circulation, Movement, Limnology.
Identifiers: *Vertical motions.

A ten-day upwelling episode in deep water along the north shore of Lake Superior was documented by means of continuous temperature records at nine levels and horizontal currents at three levels. Wind observations at the nearest onshore point were also included. Vertical motions in the water column started below the 150 m level and did not extend to near surface levels until the fifth day. Vertical velocities reached 30 m per day during part of the episode. Upwelling occurs once or twice each month during the period of thermal stratification in this region. Due to their magnitude these motions must play a significant role in the vertical transport of nutrients and plankton of the lake and may be an important factor in maximizing the potential productivity of the lake. (See also W76-11275) (Sims-ISWS)
W76-11311

MODELING CHLORIDE DISTRIBUTION IN SAGINAW BAY,
Environmental Protection Agency, Gross Ile, Mich. Gross Ile Lab.
For primary bibliographic entry see Field 5B.
W76-11312

MEAN MONTHLY SURFACE TEMPERATURES OF LAKE ONTARIO FROM APRIL 1972 TO MARCH 1973,
Atmospheric Environment Service, Toronto (Ontario). Lakes and Marine Applications Section.
W. S. Webb.
In: Proceedings, Seventeenth Conference on Great Lakes Research, Part 1; McMaster University, Hamilton (Ontario), August 12-14, 1974. International Association for Great Lakes Research, p 471-482, 1974. 13 fig, 1 tab, 13 ref.

Descriptors: *Water temperature, *Remote sensing, *Lake Ontario, Surveys, Temperature, Lakes, Seasonal, Monthly, Aircraft, Instrumentation, Climatology, Measurement, Limnology.
Identifiers: *International Field Year for the Great Lakes, Surface temperature.

From April 1972 through March 1973 inclusive, 47 airborne radiation thermometer surveys of the surface temperature of Lake Ontario were made by the Atmospheric Environment Service. A mean surface temperature was determined for each month as well as maps of spatial variations. Lake surface temperatures were found to be cooler than the corresponding 1966-71 normal values in all but three months. On three occasions (June, July, and October) surface temperatures were about 2 C below the normal. In all months, mean spatial patterns of surface temperatures closely resembled those of the normal. (See also W76-11275) (Sims-ISWS)
W76-11313

SOURCE IDENTIFICATION OF FUEL OIL SPILLS,
Ontario Ministry of the Environment, Rexdale. Lab. Services Branch.
For primary bibliographic entry see Field 5A.
W76-11314

BACTERIA AND PHOSPHORUS AS INDICATORS OF THE EXTENT OF A LARGE SEWAGE SPILL IN LAKE ERIE,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5A.
W76-11315

WATER QUALITY MODEL OF THE LOWER FOX RIVER, WISCONSIN,
Environmental Protection Agency, Anchorage, Alaska. Alaska Operations Office.
For primary bibliographic entry see Field 5B.
W76-11316

A SIMULATION MODEL FOR PHOSPHORUS WASTE DISCHARGES IN THE LAKE ERIE BASIN,
Case Western Reserve Univ., Cleveland, Ohio. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5B.
W76-11317

CHLORIDE BUILD-UP AND CONTROL IN LAKE ERIE,
State Univ. of New York at Buffalo.
For primary bibliographic entry see Field 5B.
W76-11318

THE EFFECT OF A FOSSIL FUEL POWER PLANT'S COOLING WATER SYSTEM ON THE

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WATER QUALITY OF GREEN BAY, WISCONSIN,
Wisconsin Univ., Green Bay. Coll. of Environmental Sciences.
For primary bibliographic entry see Field 5B.
W76-11319

A SIMULATION MODEL FOR LONG-TERM FORECASTING OF WASTE LOADINGS FROM POPULATION, LAND USE, AND ECONOMIC ACTIVITIES IN THE GREAT LAKES BASIN,
Canada Centre for Inland Waters, Burlington (Ontario),
For primary bibliographic entry see Field 5B.
W76-11320

A LIMNOLOGICAL SURVEY OF NEARSHORE WATERS OF LAKE SUPERIOR,
Ontario Ministry of the Environment, Toronto. Water Resources Branch.
J. D. Kinkead, and R. M. Chatterjee.
In: Proceedings, Seventeenth Conference on Great Lakes Research, Part 1; McMaster University, Hamilton (Ontario), August 12-14, 1974. International Association for Great Lakes Research, p 549-573, 1974. 14 fig, 4 tab, 16 ref.

Descriptors: *Water quality, *Surveys, *Lake Superior, On-site investigations, Pollutants, Pollutant identification, Dissolved oxygen, Suspended solids, Water temperature, Chlorophyll, Coliforms, Streptococcus, Heavy metals, Chlorides, Nitrogen, Phosphorus, Chemicals, Turbidity, Shores, Harbors, Measurement, Sampling, Limnology.

Up-to-date and accurate information about existing water quality characteristics is necessary for any future planning or management of the Great Lakes environment. Four cruises on the nearshore waters of Lake Superior were carried out during the late summer and fall of 1973 to provide a systematic water quality monitoring of the Ontario shoreline of the lake. This study generated extensive physical, chemical, and bacteriological data on 67 stations along the north shore of the lake from Whitefish Bay to Thunder Bay. In addition to this, intensive water quality studies were undertaken in the following confined areas where industrial and municipal discharges have contributed to impairment: Peninsula Harbour, Jackfish Bay, Nipigon Bay, and Thunder Bay. A comparison was made of water quality in nearshore and harbor areas including an examination of dissolved oxygen, suspended and dissolved solids, conductivity, turbidity, nitrogen, phosphorus, phenols, alkalinity, chloride, sulphate, pH, heavy metals, dissolved silica, water temperature, chlorophyll a, total and fecal coliforms, and fecal streptococci. Extensive bottom sediment studies were incorporated in the survey program to determine the regions of accumulations of heavy metals, nutrients, pesticides, phthalates, and organic matter. Generally, the overall quality of the nearshore waters of Lake Superior is high and the values of important parameters are well within the limits prescribed by the Ontario Ministry of the Environment for all uses. These waters do not appear to have been adversely affected as yet by the urban and industrial development which has caused significant localized impairment. (See also W76-11275) (Sims - ISWS)
W76-11321

AN ECONOMETRIC FORECASTING MODEL FOR THE MAJOR METROPOLITAN AREAS IN THE LAKE ERIE BASIN,
Case Western Reserve Univ., Cleveland, Ohio. Dept. of Economics.
For primary bibliographic entry see Field 5B.
W76-11322

COMPOSITION OF THE OLIGOCHAETE FAUNA OF CENTRAL LAKE MICHIGAN,
California Univ., Santa Barbara. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5C.
W76-11323

CANNIBALISM BY THE ADULT ALEWIFE (ALOSA PSEUDOGARENGUS) IN SOUTHERN LAKE MICHIGAN,
South Carolina Wildlife and Marine Resources Dept., Charleston. Marine Resources Center.
R. J. Rhodes, D. A. Webb, and T. S. McCormish.
In: Proceedings, Seventeenth Conference on Great Lakes Research, Part 1; McMaster University, Hamilton (Ontario), August 12-14, 1974. International Association for Great Lakes Research, p 593-595, 1974. 2 tab, 12 ref.

Descriptors: *Fish, *Fish behavior, *Lake Michigan, Fish diets, Larvae, Fish eggs, Fish populations, Surveys, Sampling, Freshwater fish, Lakes, Aquatic life.
Identifiers: *Alewives, *Fish cannibalism

During fall of 1971 and 1972, adult alewives (Alosa pseudoharengus) fed upon larval alewives (18-32 mm total length) in Indiana waters of Lake Michigan. Fish eggs (probably Alosa) were observed in stomachs of alewives collected in June and July of both years. Cannibalism should be included among the many factors influencing the survival of larval alewives and their subsequent recruitment to adult populations. (See also W76-11275) (Sims - ISWS)
W76-11324

PHOSPHORUS CYCLING AND LUXURY PHOSPHORUS STORAGE BY ALGAE IN THE WATERS OF GREEN BAY,
Wisconsin Univ., Green Bay. Coll. of Environmental Sciences.
For primary bibliographic entry see Field 5C.
W76-11332

VERTICAL DISTRIBUTION PATTERNS OF GOLDEYE, HIODON ALOSOIDES, IN FORT PECK RESERVOIR, MONTANA,
Kaniksu National Forest, Sandpoint, Idaho.
J. L. Cooper.
U S Nat Mar Fish Serv Fish Bull. 71(2); p 473-478, 1973.

Descriptors: *Distribution patterns, *Montana, Reservoirs, Seasonal, Temperature, Water temperature.
Identifiers: *Goldeye, Hiodon-Alosoides, *Vertical distribution patterns, Fort Peck reservoir(Mont).

In Nov. 1967 and continuing into Dec. 1969, the goldeye, H. alosoides (Rafinesque), in Fort Peck Reservoir, Montana, exhibited seasonal vertical distribution patterns, which seemed to be related to the surface-water temperature. When surface-water temperatures were above 8.9C (summer and early fall), the goldeye congregated near the surface. During the late fall, ice-covered period, and spring when surface temperatures varied between 8.9 and 1.1C, the goldeye usually congregated between the 8- and 32-ft level. It is suggested that the goldeye were following the food source and were not responding to temperature per se.--Copyright 1973, Biological Abstracts, Inc.
W76-11333

SOURCES OF WATER QUALITY, LAKE LEVEL, ICE, WATER TEMPERATURE, AND METEOROLOGICAL DATA FOR THE ST. LAWRENCE GREAT LAKES,
Wisconsin Univ., Milwaukee. Center for Great Lakes Studies.
For primary bibliographic entry see Field 7C.
W76-11363

OLIGOTROPHICATION - A SELF-ACCELERATING PROCESS IN LAKES SUBJECTED TO EXCESSIVE SUPPLY OF ACID SUBSTANCES,
Institute for Water and Air Pollution Research, Stockholm (Sweden).
For primary bibliographic entry see Field 5C.
W76-11364

FIELD STUDIES ON THE PHYTOTOXICITY OF CRUDE OIL TO SUBARCTIC AQUATIC VEGETATION.
For primary bibliographic entry see Field 5C.
W76-11405

A NUMERICAL MODEL OF THE TIME-DEPENDENT, THREE-DIMENSIONAL STRUCTURE OF CIRCULATION IN LARGE LAKES.
Geological Survey, Menlo Park, Calif.
R. T. Cheng.
Meeting Preprint 2692 for presentation at American Society of Civil Engineers National Water Resources and Ocean Engineering Convention, held in San Diego, California, April 5-8, 1976. 27 p, 8 fig, 25 ref.

Descriptors: *Model studies, *Numerical analysis, *Water circulation, *Lakes, Winds, Lake morphology, Lake morphometry, Lake shores, Bathymetry.

A mixed analytical and numerical transient circulation model is proposed. A three-dimensional circulation structure can be calculated by solving a system of depth-averaged, two-dimensional conservation equations and by evaluation of the formal solutions. Large-scale movement of water in lakes is considered. Wind stress imposed on the free surface is the primary source of momentum and energy. Due to relatively small size (when compared with the open ocean), the circulation is strongly dependent upon the lake-basin morphology. Thus, accurate representation of the basin's shoreline and bathymetry is essential. (Woodard-USGS)
W76-11422

PROCEEDINGS, SEVENTEENTH CONFERENCE ON GREAT LAKES RESEARCH, PART 2.
Proceedings of a conference held August 12-14, 1974, McMaster University, Hamilton (Ontario). International Association for Great Lakes Research, c/o Robert A. Sweeney, Treasurer, State University College, Buffalo, New York, Great Lakes Laboratory, 1974. 232 p.

Descriptors: *Great Lakes, *Limnology, *Water quality, *Biology, *Lake Ontario, Aquatic life, Water pollution, Sediments, Sands, Water temperature, Model studies, Lakes, Nutrients, Phytoplankton, Bacteria, Biomass, Pollutants, Meteorology, Atmosphere, Optical properties, Winds, Wind tides, Forecasting, Clouds.
Identifiers: *International Field Year for the Great Lakes.

The papers were grouped under the general headings of biology, chemical limnology, geology/geochemistry, meteorology/hydrology, physical limnology, and water quality. A wide variety of research on the Great Lakes was reported. Many of the papers dealt with research related to the International Field Year for the Great Lakes (IFYGL), a North American contribution to the International Hydrologic Decade (IHD). A subject index for both parts of this proceedings was included in this volume. (See W76-11425 thru W76-11442) (Sims-ISWS)
W76-11424

THE ABUNDANCE OF DIATOMS IN THE SOUTHWESTERN NEARSHORE REGION OF

LAKE ONTARIO DURING THE SPRING THERMAL BAR PERIOD,
State Univ. of New York Coll. at Buffalo. Great Lakes Lab.
G. J. Lorefice, and M. Munawar.
In: Proceedings, Seventeenth Conference on Great Lakes Research, Part 2; McMaster University, Hamilton (Ontario), August 12-14, 1974. International Association for Great Lakes Research, p 619-628, 1974. 3 fig, 4 tab, 25 ref. EPA 800701.

Descriptors: *Diatoms, *Phytoplankton, *Lake Ontario, Surveys, Sampling, Plankton, Aquatic microorganisms, Temperature, Water temperature, Biomass, Aquatic life, Silica, Nitrogen, Phosphorus, Nutrients, Shores, Lakes, Limnology, Biology.
Identifiers: *Thermal bars.

As part of the IFYGL program an intensive study was carried out during April and May 1972 in the nearshore region of Lake Ontario. Water samples were collected from 45 stations on the southwestern nearshore area of Lake Ontario at 1/2, 4 and 8 kms from the shore. Using the Utermohl technique, phytoplankton was analyzed qualitatively and quantitatively. During the investigation period the thermal bar remained within the study area. In April it stayed shoreward of the 4 kms stations, dipping into and out of the shore. By May it had advanced farther out but in most cases to less than 8 kms. Total phytoplankton biomass along with diatoms, particularly Melosira binderana Kutz. showed high concentrations on the nearshore side of the thermal bar. This observation may be related to temperature and the concentration of nutrients in the nearshore region. Diatoms accounted for 58% of the biomass in April and 48% in May. During April Surirella angustata Kutz., Rhodomonas minuta Skuja and Peridinium aciculiferum (Lemm.) Lemm. were the most common species while M. binderana Kutz., P. aciculiferum, and Melosira islandica ssp. helvetica O. Muller were common in May. (See also W76-11424) (Sims-ISWS)
W76-11425

PHYTOPLANKTON BIOMASS, SPECIES COMPOSITION AND PRIMARY PRODUCTION AT A NEARSHORE AND A MIDLAKE STATION OF LAKE ONTARIO DURING IFYGL,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5C.
W76-11426

A PRELIMINARY STUDY ON THE OCCURRENCE AND DISTRIBUTION OF GEOFUNGI IN LAKE ONTARIO NEAR THE NIAGARA RIVER,
Canada Centre for Inland Waters, Burlington (Ontario).
A. A. Qureshi, and B. J. Dutka.
In: Proceedings, Seventeenth Conference on Great Lakes Research, Part 2; McMaster University, Hamilton (Ontario), August 12-14, 1974. International Association for Great Lakes Research, p 653-662, 1974. 3 fig, 5 tab, 48 ref.

Descriptors: *Fungi, *Aquatic fungi, *Lake Ontario, Sampling, Surveys, Pollutant identification, Water pollution, Rivers, Lakes, Laboratory tests, Analytical techniques, Coliforms, Streptococcus, Pollutants, Nutrients, Bacterica, Indicators, Limnology, Bioindicators.
Identifiers: *Niagara River(NY), *Geofungi.

The occurrence, distribution and relative abundance of geofungi in water samples, collected from Lake Ontario near the mouth of the Niagara River, were examined to determine their relationship to other water pollution indicator parameters. The results suggested a relationship between geofungi and certain physical, chemical and bacteriological parameters. The significance of the presence of geofungi in aquatic environment and their possible use as water pollution indicator organisms were discussed. (See also W76-11424) (Sims - ISWS)
W76-11427

BACTERIAL POPULATIONS IN LOWER GREEN BAY,
Wisconsin Univ. Green Bay, Coll. of Environmental Sciences.
L. J. Schwartz.
In: Proceedings, Seventeenth Conference on Great Lakes Research, Part 2; McMaster University, Hamilton (Ontario), August 12-14, 1974. International Association for Great Lakes Research, p 663-667, 1974. 1 fig, 3 tab, 9 ref.

Descriptors: *Bacteria, *Water pollution, *Bays, *Lake Michigan, Rivers, Lakes, Sampling, Surveys, Coliforms, Streptococcus, Sewage, Sewage effluents, Sewage bacteria, Pollutants, Sewage treatment.
Identifiers: *International Field Year for the Great Lakes, *Green Bay(Wis), *Fox River(Wis).

A study was undertaken to determine bacterial densities in lower Green Bay. Water samples were collected monthly from a relatively fine grid sampling network covering approximately 25 sq km of the lower bay. Standard bacteriological techniques were employed to isolate total and fecal coliform, fecal streptococci, and total bacteria (plate count). Results indicated that the major source of bacterial input into lower Green Bay is via the Fox River. A large contributor to this bacterial load is the effluent discharge of a 20 mgd sewage treatment plant near the mouth of the river. Highest bacterial densities were obtained at the mouth of the river with decreasing densities as the distance increased from the river's mouth. Fecal coliform counts ranged in the hundreds of thousands per 100 ml at some locations. Fecal coliform--fecal streptococci ratios often exceeded four, indicative of human fecal contamination. (See also W76-11424) (Sims - ISWS)
W76-11428

IFYGL STREAM MATERIALS BALANCE STUDY,
Environmental Protection Agency, Rochester, N. Y.
For primary bibliographic entry see Field 5B.
W76-11429

IFYGL CHEMICAL INTERCOMPARISONS,
National Oceanic and Atmospheric Administration, Ann Arbor, Mich. Great Lakes Environmental Research Lab.
A. Robertson, F. C. Elder, and T. T. Davies.
In: Proceedings, Seventeenth Conference on Great Lakes Research, Part 2; McMaster University, Hamilton (Ontario), August 12-14, 1974. International Association for Great Lakes Research, p 682-696, 1974. 8 tab, 5 ref.

Descriptors: *Sampling, *Water chemistry, *Analytical techniques, *Great Lakes, Surveys, Chemistry, Laboratory tests, *Chemical analysis, Ships, Lakes, Nutrients, Chemicals, Metals, Turbidity, Analysis, *Pollutant identification, Water pollution, Limnology.
Identifiers: *International Field Year for the Great Lakes.

During the IFYGL program three separate intercomparisons of chemical determinations were conducted. In the first study, samples of known concentration for a number of properties were sent for analysis to several laboratories. Statistical evaluation of the results from these determinations showed that, except for sodium, there was little evidence that the means for the laboratory determinations differed from the comparable known concentrations. However, the results of this study did indicate that, for most of the properties, there were systematic differences among the results from the participants. In the second study, samples were obtained at four depths at each of two stations and each sample was split into four parts. For one of these a number of determinations were conducted immediately on the vessel. The other three subsamples were frozen and sent to three of the major IFYGL laboratories, and the same analyses were conducted as aboard the ship. This procedure was carried out five different times. Analysis of the results showed statistically significant differences among the results from the three laboratories for many of the parameters. In the third study, several of the vessels involved in IFYGL were brought together and similar sampling programs were carried out on each. Series of replicate samples were obtained by each vessel and one of the replicates was analyzed by each of the three participating laboratories. The data for this work indicated that differences in sampling methods among the vessels probably have a relatively minor effect on the results obtained. (See also W76-11424) (Sims - ISWS)
W76-11430

HEAVY MINERALS IN THE SANDS OF SOUTHERN AND EASTERN LAKE ONTARIO,
Rochester Univ. N. Y. Dept. of Geological Sciences.
For primary bibliographic entry see Field 2J.
W76-11431

CLOUD ANALYSIS AND DIAGNOSIS OVER LAKE ONTARIO AND VICINITY,
Center for the Environment and Man, Inc. Hartford, Conn.
J. T. Ball.
In: Proceedings, Seventeenth Conference on Great Lakes Research, Part 2; McMaster University, Hamilton (Ontario), August 12-14, 1974. International Association for Great Lakes Research, p 704-712, 1974. 7 tab, 5 ref. NOAA 2-35353

Descriptors: *Clouds, *Lake Ontario, *Forecasting, Correlation analysis, Temperature, Air temperature, Humidity, Atmosphere, Solar radiation, Lakes, Seasonal, Meteorology.
Identifiers: *International Field Year for the Great Lakes, Middle clouds, High clouds.

The computation of the radiation budget of Lake Ontario requires a reasonably accurate analysis of the horizontal and vertical distribution of cloudiness. Results have shown that radiative fluxes computed at the surface are highly sensitive to cloud amount. Objective analyses of low, middle, and high cloud amount were obtained at three-hourly intervals during the period April 1972 through March 1973. Possible lake effects on low cloud amount were investigated during the July 1972 to November 1972 period, and statistical relationships were derived. Serious errors can be introduced into solar radiation computations during periods of persistent, extensive, low cloud overcast due to errors in estimating the amount of middle and high clouds. During the IFYGL, observations of middle and high cloud amount were completely lacking about 10% of the time. To alleviate this problem, a study was conducted to develop diagnostic procedures to estimate middle and high cloud amount above a low overcast. Multiple linear regression equations were developed relating middle and high cloud amount to predictors derived from Buffalo radiosonde observations taken on OOGMT and 12GMT. The predictors were mainly temperature and moisture dependent variables between the 850- and 400-mb constant pressure surfaces. Equations were developed for the entire sample of 597 cases and for seasonal stratifications of the sample. The diagnostic results obtained were shown to be superior to assuming conditions of clear, overcast or climatological averages for upper-level cloud amounts. (See also W76-11424) (Sims - ISWS)
W76-11432

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PRELIMINARY ENERGY BUDGET OF LAKE ONTARIO FOR THE PERIOD MAY THROUGH NOVEMBER, 1972,
Canada Centre for Inland Waters, Burlington (Ontario).
F. C. Elder, F. M. Boyce, and J. A. Davies.
In: Proceedings, Seventeenth Conference on Great Lakes Research, Part 2; McMaster University, Hamilton (Ontario), August 12-14, 1974. International Association for Great Lakes Research, p 713-724, 1974. 8 fig, 2 tab, 15 ref.

Descriptors: *Energy budget, *Thermal radiation, *Lake Ontario, Solar radiation, Temperature, Water temperature, Evaporation, Radiation, Albedo, Heat transfer, Heat budget, Heat balance, Lakes, Energy, Heat, Latent heat, Limnology.
Identifiers: *International Field Year for the Great Lakes.

Measurements were made during the International Field Year for the Great Lakes which permit calculation of the thermal energy budget for Lake Ontario for the April to December period. A network of meteorological measurement stations provided data from which latent and sensible heat flux were calculated. Global solar and long-wave radiation measurements allowed assessment of the net radiation balance. Approximate bi-weekly intensive temperature surveys provided for independent computation of the lake heat storage. Over the period for which measurements were available, the measured heat storage exceeded the value calculated from the energy budget by over 8000 cal/sq cm. This amounts to difference of 33 cal/sq cm/day or approximately 5% of the maximum daily flux. Analysis of the possible error in each of the budget terms indicated that the net radiation calculations are most likely the largest contributor. The incoming long-wave radiation estimates are least subject to verification and are believed to contain the greatest degree of uncertainty. (See also W76-11424) (Sims - ISWS)
W76-11433

GREAT LAKES WIND FORECASTS BASED ON MODEL OUTPUT STATISTICS,
National Weather Service, Silver Spring, Md. Techniques Development Lab.
D. M. Feit, and C. S. Barrientos.
In: Proceedings, Seventeenth Conference on Great Lakes Research, Part 2; McMaster University, Hamilton (Ontario), August 12-14, 1974. International Association for Great Lakes Research, p 725-732, 1974. 4 fig, 4 ref.

Descriptors: *Winds, *Forecasting, *Great Lakes, Computer models, Mathematical models, Computer programs, Stability, Temperature, Boundary layers, Atmosphere, Lakes, Meteorology.
Identifiers: *Wind forecasting, Forecasting models.

An automated objective method to forecast the maximum steady winds at twelve locations over the five Great Lakes has been developed for routine use by the National Weather Service. The developmental approach is statistical in nature and is based on the Model Output Statistics (MOS) technique. This technique matches the output from a numerical model (predictors) with observations (predictands) and computes a prediction equation. The predictors are various forecast elements computed by the National Meteorological Center's Primitive Equation (PE) model. The predictands are wind observations taken by vessels operating on the Great Lakes. A multiple regression screening program was used to derive the prediction equations. Multiple correlation coefficients of .83 to .40 were obtained between predictors and predictands. Separate sets of equations were derived for each of six forecast periods out to 36 hours. For each period, a set of three equations was derived consisting of U- and V-components and wind speed equation. Distinct sets of equations were developed for the summer and winter seasons and for the 0000 GMT and 1200 GMT PE model origin times. User stations have indicated that the forecasts are useful and synoptically reasonable. (See also W76-11424) (Sims - ISWS)
W76-11434

OBJECTIVE ANALYSIS OF IFYGL SURFACE METEOROLOGICAL DATA,
National Oceanic and Atmospheric Administration, Washington, D. C.
J. B. Jalickee, J. K. S. Ching, and J. A. Almazan.
In: Proceedings, Seventeenth Conference on Great Lakes Research, Part 2; McMaster University, Hamilton (Ontario), August 12-14, 1974. International Association for Great Lakes Research, p 733-750, 1974. 17 fig, 12 ref.

Descriptors: *Data processing, *Meteorological data, *Lake Ontario, Computer programs, Analytical techniques, Air temperature, Water temperature, Winds, Humidity, Weather, Mathematics, Mathematical models, Lakes, Meteorology.
Identifiers: *International Field Year for the Great Lakes, Objective analytical techniques.

An objective analysis scheme has been developed for the analysis of IFYGL data. Observed values of a given meteorological field were fitted to a model consisting of polynomials in the space-time variables in the sense of generalized least squares. Orthogonal polynomials, formed accurately from base polynomials by a Gram-Schmidt reorthogonalization procedure, were used to effect the least-squares fit. Meteorological data from the Canadian buoys and the U. S. buoys and towers were analyzed for two time periods by means of the objective analysis technique. The two periods chosen were 7 to 21 July and 1 to 10 October 1972. The former was characterized by near-neutral atmospheric conditions, the latter by unstable conditions. Objective analyses were done of air temperature, surface temperature, wind, and humidity in order to obtain area averages for Lake Ontario. Similarly, area averages were computed of estimates of momentum, heat, and water-vapor surface fluxes derived by the bulk aerodynamic method. Fields of the lateral and longitudinal wind components and of vorticity and divergence were presented. The results of these analyses were evaluated with respect to synoptic conditions and were also compared with results obtained by the station-averaging method. (See also W76-11424) (Sims - ISWS)
W76-11435

THE ATMOSPHERIC BUDGETS PROGRAM OF IFYGL,
National Oceanic and Atmospheric Administration, Washington, D. C. Environmental Data Service.
E. M. Rasmusson, H. L. Ferguson, J. Sullivan, and J. den Hartog.
In: Proceedings, Seventeenth Conference on Great Lakes Research, Part 2; McMaster University, Hamilton (Ontario), August 12-14, 1974. International Association for Great Lakes Research, p 751-777, 1974. 18 fig, 5 tab, 25 ref.

Descriptors: *Heat budget, *Water vapor, *Lake Ontario, Atmosphere, Analytical techniques, Lakes, Evaporation, Winds, Air temperature, Humidity, Data processing, Heat transfer, Weather, Weather data, Meteorological data, Limnology, Meteorology.
Identifiers: *International Field Year for the Great Lakes, *Atmospheric budgets, Objective analytical techniques.

The water vapor and heat budgets of the atmosphere over Lake Ontario was evaluated to obtain estimates of average lake evaporation for periods on the order of a week. Data for this project were obtained during September-December 1972 from a six-station network of LORAN-C rawinsonde stations located along the perimeter of the lake. The design of the experiment and results of the field program were reviewed. Unexpected errors in the LORAN C time delay data required a significant sacrifice of vertical resolution in the processed wind data. However, the relatively high time and vertical resolution of the temperature and humidity data revealed the detailed structure of these fields to a degree not attainable with routine operational data. A set of conservation equations, suitable for budget analyses over Lake Ontario, was derived. Special attention was given to the possibility of phase change between liquid, solid, and vapor states, and problems arising when the flux of condensed moisture across the shoreline is significant. A budget analysis scheme was discussed in which the meteorological fields are represented in terms of a set of orthoganal functions in time and space. Examples of fitted wind and humidity fields were presented. (See also W76-11424) (Sims - ISWS)
W76-11436

DETERMINATION OF THE AERODYNAMIC DRAG COEFFICIENT FROM WIND SET-UP,
Canada Centre for Inland Waters, Burlington (Ontario).
M. A. Donelan, F. C. Elder, and P. F. Hamblin.
In: Proceedings, Seventeenth Conference on Great Lakes Research, Part 2; McMaster University, Hamilton (Ontario), August 12-14, 1974. International Association for Great Lakes Research, p 778-788, 1974. 5 fig, 1 tab, 20 ref.

Descriptors: *Wind tides, *Drag, *Lake Ontario, Winds, Stress, Stability, Atmospheric pressure, Water levels, Lakes, Currents(Water), Water temperature, Seiches, Rotations, Tides, Waves(Water), Wave pile-up, Fluid mechanics, Limnology.
Identifiers: *International Field Year for the Great Lakes.

The estimation of wind stress from the steady state water set-up of an enclosed water body is fraught with uncertainties arising primarily from measurement errors of the overall wind field and the water level in the presence of shoaling waves. During the IFYGL there were several accurate water level recording gages installed around Lake Ontario, and the wind field was monitored continuously at a score of stations across the Lake. In addition, a 'deep water' gage was installed off Niagara-on-the-Lake. This gage was compared with nearby gages in shallower water to assess the effect of wave set-up on the water level measurement in shallower water. This was concluded that the difference in water level between Burlington and Oswego is probably accurate for eastward surface stress. The effects of atmospheric pressure, tides and seiches were removed and the error due to bottom stress was shown to be small. Finally the corrected and filtered water levels were correlated with the lake-wide average stress and drag coefficient deduced for unstable and neutral atmospheric boundary layers. The drag coefficient obtained from the data points without regard to stability was 0.00135; that for neutral conditions was smaller, and unstable conditions larger. (See also W76-11424) (Sims - ISWS)
W76-11437

SHORT PERIOD TIDES IN LAKE ONTARIO,
Canada Centre for Inland Waters, Burlington (Ontario).
P. F. Hamblin.
In: Proceedings, Seventeenth Conference on Great Lakes Research, Part 2; McMaster University, Hamilton (Ontario), August 12-14, 1974. International Association for Great Lakes Research, p 789-800, 1974. 8 fig, 3 tab, 12 ref.

Descriptors: *Tides, *Lakes, *Lake Ontario, Circulation, Water circulation, Model studies, Mathematical models, Equations, Diurnal, Water level, Hydrodynamics, On-site investigations, Limnology.
Identifiers: *International Field Year for the Great Lakes.

The diurnal and semidiurnal tides of Lake Ontario were simulated numerically by means of a numerical hydrodynamical model in which only the spacial derivatives are discretized. The semianalytical model predicted a direct response for both tidal constituents, that is, in the direction of rotation of the tidal generating force. The sense of rotation was cum sole for the semidiurnal oscillation and in the opposite sense for the diurnal tide. Maximum predicted amplitudes of 12.1 mm occurred at the western extremity of the lake for the semidiurnal tide and 5.2 mm at the same location for the diurnal tide. The main feature of the predicted response, that the semidiurnal tide rotates in a clockwise direction was corroborated by the observations at 16 tidal gages around the lake. An amphidromic point in both the model and prototype was located at a mid-lake position to the north of Rochester. The tidal solutions were relatively insensitive to bottom friction which does not reasonably account for the fact that the observed amplitudes are 70% of the theoretical amplitudes. This discrepancy was well explained by the effect of the earth tide and was in close agreement with measurements of the earth tide found in the literature. (See also W76-11424) (Sims - ISWS)
W76-11438

TRANSIENT THERMAL RESPONSE OF LARGE LAKES TO ATMOSPHERIC DISTURBANCES,
Hydronautics Inc., Laurel Md.
T. R. Sundaram.
In: Proceedings, Seventeenth Conference on Great Lakes Research, Part 2; McMaster University, Hamilton (Ontario), August 12-14, 1974. International Association for Great Lakes Research, p 801-810, 1974. 4 fig, 19 ref.

Descriptors: *Thermal properties, *Thermocline, *Model studies, *Lakes, Thermal stratification, Seasonal, Temperature, Water temperature, Mixing, Heat, Winds, Energy, Mathematical models, Laboratory tests, On-site investigations, Limnology.
Identifiers: *Thermal bar.

A length scale which is a measure of the relative magnitudes of the fluxes of thermal and wind-induced mixing energies at the surface of a lake was used to describe the transient thermal response of a lake to changes in atmospheric condition above it. This length scale was used previously to describe the seasonal stratification cycle. Two specific transient phenomena were considered here as examples, namely, thermocline erosion due to a sudden storm and the thermal bar. The rate of downward erosion of the thermocline due to a storm was calculated in terms of the wind conditions and the results are compared with those of existing laboratory experiments. A theoretical model was also developed for the formation, evolution and ultimate disappearance of the thermal bar. The results were again compared with available laboratory and field data. (See also W76-11424) (Sims - ISWS)
W76-11439

OPTICAL PROPERTIES OF THE GREAT LAKES,
Canada Centre for Inland Waters, Burlington (Ontario).
K. P. B. Thomson, J. Jerome, and W. R. McNeil.
In: Proceedings, Seventeenth Conference on Great Lakes Research, Part 2; McMaster University, Hamilton (Ontario), August 12-14, 1974. International Association for Great Lakes Research, p 811-822, 1974. 12 fig, 1 tab, 8 ref.

Descriptors: *Optical properties, *Lake Ontario, *Great Lakes, *Lake Superior, *Lake Erie, On-site investigations, Model studies, Statistical models, Light, Solar radiation, Turbidity , Water properties, Physical properties, Analytical techniques, Lakes, Chlorophyll, Limnology.
Identifiers: *Optical transmittance, Organic particles.

During the IFYGL, a series of in situ optical measurements were carried out as part of the Lake Ontario Organic Particle Study. The principal optical measurement made during each cruise was the downwelling irradiance of sunlight, from 400-700 nm, as a function of depth. These data were used to investigate the optical characteristics of Lake Ontario in terms of the spectral transmittance of the downwelling irradiance. Similar measurements from Lake Erie and Lake Superior were analyzed and compared with the Lake Ontario data. The analysis and intercomparison of the data for the three Great Lakes was based on Vollenweider's statistical model of the extinction coefficient. Significant deviations from Vollenweider's standard distribution could be identified as differences in the optical characteristics of a lake resulting from the limnological properties of the particular water body. Comparison of the extinction and the linear regression coefficients obtained from the Great Lakes to the standard distribution showed significant deviations in the blue (430 nm) and red (630 nm) regions of the spectrum. These differences were interpreted to mean that the Laurentian Great Lakes contain appreciable amount of humic substances; this was substantiated by laboratory absorption measurements on filtered samples. The data also showed that the seasonal variations of the mean vertical extinction coefficient delineate clearly the physical and biological changes in the lakes. The mean vertical extinction coefficient can be used as a gross indicator of the general optical state of the lake. (See also W76-11424) (Sims - ISWS)
W76-11440

PHOSPHATE, ALGAE, AND TACONITE TAILINGS IN THE WESTERN ARM OF LAKE SUPERIOR,
Texas Univ. at Dallas. Richardson. Inst. for Environmental Sciences.
For primary bibliographic entry see Field 5C.
W76-11441

A MODEL FOR THE STUDY OF EPISODES IN THE DISPERSION OF A CONSERVATIVE POLLUTANT IN LAKE MICHIGAN,
Illinois Univ., at Chicago Circle, Chicago. Dept. of Information Engineering.
For primary bibliographic entry see Field 5B.
W76-11442

PARTICULATE RESIDENCE TIMES,
Atmospheric Environment Service, Toronto (Ontario).
For primary bibliographic entry see Field 5A.
W76-11450

HYPOLIMNION OXYGENATION,
Union Carbide Corp., New York. (Assignee).
For primary bibliographic entry see Field 5G.
W76-11454

POPULATION DYNAMICS AND PRODUCTION OF DAPHNIA HYALINA IN A EUTROPHIC RESERVOIR,
Freshwater Biological Association, Wareham (England). Windermere Lab.
For primary bibliographic entry see Field 5C.
W76-11457

HYDRAULIC MODEL STUDIES OF MECHANICAL MIXING DEVICES IN STRATIFIED LAKES,
Oklahoma State Univ., Stillwater. School of Mechanical and Aerospace Engineering.
For primary bibliographic entry see Field 8B.
W76-11495

INVERTEBRATE FAUNA OF THE LAKES OF THE LOWER TAREYA RIVER (WESTERN TAIMYR), (IN RUSSIAN),
Moscow State Univ. (USSR). Dept. of Invertebrate Zoology.
For primary bibliographic entry see Field 5C.
W76-11537

BACTERIAL POPULATIONS IN SKADAR LAKE, (IN SERBO-CROATIAN),
Zavod Za Biologiju Mora, Kotor (Yugoslavia).
For primary bibliographic entry see Field 5C.
W76-11538

INCREASE OF PRIMARY PRODUCTION IN A BAY OF MALYI ZHEMCHUZHNYI ISLAND (NORTH CASPIAN) USING INORGANIC FERTILIZERS, (IN RUSSIAN),
Kaspiiskii Nauchno-Iseledovatelskii Institut Rynogo Khozyaistva, Astrakhan (USSR).
For primary bibliographic entry see Field 5C.
W76-11553

FEATURES OF FRESHWATER ECOSYSTEMS (FROM THE RESULTS OF SOVIET PARTICIPATION IN THE INTERNATIONAL BIOLOGICAL PROGRAM), (IN RUSSIAN),
Akademiya Nauk SSSR, Leningrad. Zoologicheskii Institit.
For primary bibliographic entry see Field 5C.
W76-11556

PHYSICO-CHEMICAL PARAMETERS OF THE HYDROGRAPHIC SYSTEM OF LAKE NANTUA: RELATION WITH OSCILLATORIA, (IN FRENCH),
Station d'Hydrobiologie Continentale, Thonon-les-Bains (France).
For primary bibliographic entry see Field 5C.
W76-11575

THE EFFECTS OF NTA ON THE GROWTH OF PHYTOPLANKTON WITH PARTICULAR CONSIDERATION GIVEN TO IRON AS A MICROELEMENT,
Eidgenoessische Anstalt fuer Wasserversorgung, Abwasserreinigung und Gewaesserschutz, Zurich (Switzerland).
For primary bibliographic entry see Field 5C.
W76-11578

EFFECT OF TREATED SEWAGE EFFLUENTS ON PHYTOPLANKTON IN LAKES, (IN GERMAN),
Eidgenoessische Anstalt fuer Wasserversorgung, Abwasserreinigung und Gewaesserschutz, Zurich (Switzerland).
For primary bibliographic entry see Field 5C.
W76-11579

BIOLOGICAL-PRODUCTIVE INVESTIGATIONS OF ZOOPLANKTON IN THE LAKES AND WATER RESERVOIRS OF THE USSR (GENERAL RESULTS OF THE INTERNATIONAL BIOLOGICAL PROGRAM), (IN RUSSIAN),
Akademiya Nauk SSSR, Leningrad. Zoologicheski Institut.
M. B. Ivanova.

Descriptors: *Zooplankton, *Lakes, *Reservoirs, Productivity, Biology, Phytoplankton, Predation.
Identifiers: *International Biological Program(USSR).

A brief summary of investigations bearing on the biological productivity of zooplankton in reservoirs located in various geographical zones is presented. A general decrease in species diversity and quantity from the S towards the N was observed. Data regarding the production of separate

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trophic levels of the herbivorous zooplankton and predators of the 1st order are given. Production depends on the biomass of the animals forming a given trophic level and the duration of the growing season. The ratio of the production of herbivorous zooplankton to the primary production of the phytoplankton varies from 2.2-20.7%. The humus-containing reservoirs this value is considerably higher--30%. The production of the predatory zooplankton is an average 19.1% of that of the herbivorous zooplankton.--Copyright 1976, Biological Abstracts, Inc.
W76-11581

A COMPARISON OF THE ABUNDANCE AND DIVERSITY OF FOSSIL PIGMENTS IN WETLAND PEATS AND WOODLAND HUMUS LAYERS,
Ohio Wesleyan Univ., Delaware. Dept. of Botany and Bacteriology.
For primary bibliographic entry see Field 5C.
W76-11601

OBSERVATIONS ON THE CESTODE EUBOTHRIUM SALVELINI IN JUVENILE SOCKEYE SALMON (ONCORHYNCHUS NERKA) AT BABINE LAKE, BRITISH COLUMBIA,
Fisheries and Marine Service, Nanaimo (British Columbia). Biological Station.
For primary bibliographic entry see Field 5C.
W76-11624

2I. Water In Plants

EFFECTS OF WATER STRESS UNDER CONTRASTING ENVIRONMENTAL CONDITIONS ON TRANSPIRATION AND PHOTOSYNTHESIS IN SOYBEAN,
Department of Scientific and Industrial Research, Palmerston North (New Zealand) Plant Physiology Div.
For primary bibliographic entry see Field 3F.
W76-11362

TRANSPIRATION AND PHOTOSYNTHESIS IN SOYBEAN: EFFECTS OF TEMPERATURE AND VAPOUR PRESSURE DEFICIT,
Department of Scientific and Industrial Research, Palmerston North (New Zealand) Plant Physiology Div.
For primary bibliographic entry see Field 3F.
W76-11407

FOOD AND GROWTH PARAMETERS OF JUVENILE CHINOOK SALMON, ONCORHYNCHUS TSHAWYTSCHA, IN CENTRAL COLUMBIA RIVER,
Battelle-Pacific Northwest Labs., Richland, Wash. Ecosystems Dept.
C. D. Becker.
U S Nat Mar Fish Serv Fish Bull. 71(2), p 387-400, 1973.

Descriptors: *Chinook salmon, *Columbia River, Washington, *Diptera, *Fish diets, *Fish growth, Aquatic insects, Juveniles.
Identifiers: Collembola, Notonectidae, Oncorhynchus-Tshawytscha, Trichoptera.

Juvenile chinook salmon, 0. tshawytscha, in the Hanford area of the free-flowing central Columbia River, Washington consume almost entirely adult and larval stages of aquatic insects. Their diet is dominated by midges (Diptera:Chironomidae). By numbers, adult midges provided 64 and 58% of the diet and larval midges 17 and 18% of the diet, in 1968 and 1969, respectively. The families Hydropsychidae (Trichoptera or caddisflies), Notonectidae (Hemiptera or true bugs), and Hypogastruridae (Collembola or springtails) are of minor numerical importance with a combined utilization of 7% in 1968 and 15% in 1969. Distinctive features of food and feeding activity of juvenile chinook salmon at Hanford are 4-fold: the fish utilize relatively few insect groups, predominantly Chironomidae; they depend largely upon autochthonous river organisms, they select prey drifting, floating, or swimming in the water; and they are apparently habitat opportunists to a large extent. Analysis were made of variation in diet and mumbers of insects consumed between 6 sampling stations distributed along a 38-km section of the river. Data are provided on feeding intensity, fish lengths, length-weight relationships, and coefficients of condition. Seasonal changes in river temperature and discharge, as well as variations in regulated flow levels, are environmental features influencing feeding, growth, and emigration of fish in the Hanford environs.--Copyright 1973, Biological Abstracts, Inc.
W76-11411

THE TILTED FOREST: GLACIOLOGICAL-GEOLOGIC IMPLICATIONS OF VEGETATED NEOGLACIAL ICE AT LITUYA BAY, ALASKA,
Geological Survey, Tacoma, Wash
For primary bibliographic entry see Field 2C.
W76-11423

SOIL WATER UPTAKE BY ALFALFA,
Agricultural Research Service, Kimberly, Idaho, Snake River Conservation Research Center.
For primary bibliographic entry see Field 3F.
W76-11504

DROUGHT RESISTANCE CHARACTERISTICS OF BLUE GRAMA SEEDLINGS,
Agricultural Research Service, Fort Collins, Colo.
A. M. Wilson, D. N. Hyder, and D. D. Briske.
Agronomy Journal, Vol. 68, No. 3, p 479-484, May-June 1976. 5 fig, 3 tab, 11 ref.

Descriptors: *Drought resistance, *Planting management, *Grama grasses, *Root development, *Plant growth, Plant morphology, Xylem, Stomata, Evaporation, Transpiration, Moisture uptake, Greenhouses, Leaves, Environmental control.
Identifiers: *Blue grama seedling, Bouteloua gracilis.

Blue grama (Bouteloua gracilis) seedling drought resistance was studied in relation to stages of shoot and root development. Seedlings restricted to the seminal root or one or two adventitious roots were grown in moist soil of a controlled environment chamber, in a greenhouse and in the field; shoot environment drought was measured by the evaporation rate from a standard pan. Growth drought resistance, which was defined as shoot environment drought sufficient to stop seedling leaf area expansion, was directly related to the critical evaporation/transpiration ratio for seedling growth and to the maximum root water uptake rate. Drought resistance was also inversely proportional to seedling leaf area. In an environment with a constant evaporation rate, leaf area increased to the water supply limit when evaporation from a free water surface was six times greater than transpiration. The amount of vascular tissue in the blue grama root does not increase as the seedling grows. Thus, when a dry surface soil prevents adventitious root formation the size and number of xylem vessels in the seminal root and subcoleoptile internode impose a limit on the volume of water that can be transported to the shoot. (Jahns-Arizona)
W76-11505

NITROGEN-SILICON INTERACTION IN PLANTS GROWN IN DESERT SOIL WITH NITROGEN DEFICIENCY,
California Univ., Los Angeles. Lab. of Nuclear Medicine and Radiation Biology.
For primary bibliographic entry see Field 3F.
W76-11509

CARISSA DIEBACK: ETIOLOGY SUGGESTS CONTROL.,
Agricultural Research Center, Fort Lauderdale, Fla.
R. F. McCoy
Proc Fla State Hortic Soc. 85, p 363-364, 1972

Descriptors: *Root systems, *Saturated soils, *Fungi, *Fungicides
Identifiers: Benomyl, *Carissa-Grandiflora, Dieback, Etiology, Phytophthora-Sp, Rhizoctonia-Solani, Terrazole, *Root rot

Defoliation and dieback of stems of potgrown Carissa grandiflora cv. Boxwood Beauty and 'Bonsai' were found associated with waterlogged soil and severe root rot. Rhizoctonia solani and Phytophthora sp. were consistently isolated from rotting Carissa roots. Both fungi were root rotters but benomyl, which controlled Rhizoctonia root rot, was ineffective against Phytophthora. Phytophthora was adequately controlled by terrazole, which in turn, was ineffective against Rhizoctonia. The existence of such disease complex may help explain the inability of either of these compounds to provide control of Carissa dieback in field tests.--Copyright 1974, Biological Abstracts, Inc.
W76-11513

NITROGEN FLUX INTO CORN ROOTS AS I FLUENCED BY SHOOT REQUIREMENT,
Agricultural Research Service, Byron, Ga.
For primary bibliographic entry see Field 3F.
W76-11519

FOOD HABITS OF YEARLING AND ADU STRIPED BASS, MORONE SAXATIL (WALBAUM), FROM ALBEMARLE SOUN NORTH CAROLINA,
National Marine Fisheries Service, Beaufort, C. Atlantic Estuarine Fisheries Center.
C. S. Manooch, III
Chesapeake Sci. 14(2), p 73-86, 1973.

Descriptors: *Bass, *Fish diets, *North Caroli *Sounds, Amphipoda, Shrimp, Herring, Cra *Fish food organisms.
Identifiers: Alosa-aestivalis, Anchoa-mitchi Brevoortia-tyrannus, Callinectes-sapidus, Ga marid, Morone-saxatils, Penaeid, *Alberma Sound(NC), Striped bass.

A total of 1094 yearling and adult striped bass, saxatilis, were collected from Albemarle Sou North Carolina from July 1970 through Aug 1971. Specimens were captured by gill nets, h and line, trawl, pound nets, and purse seine, ranged in size from 125-714 mm total length. proximately 77% of the fish contained food c sisting of 3249 individual organism. Of 25 spec groups of food organisms identified, 15 were s cies of fish and 10 were taxa of invertebrates. were the main foods of striped bass and occur in 93% of the stomachs containing food. Predo nant species identified were Atlantic menhad Brevoortia tyrannus, blueback herring, A aestivalis, and bay anchovy, Anchoa mitchilli. vertebrates were of secondary importance consisted mainly of blue crabs, Callinec sapidus, penaeid shrimp, and gammarid phipods. Food habits varied substantially with of fish, area, and season of collection. Canni ism was rarely encountered. Only 2 year striped bass from over 200 examined (1%) tained young M. saxatilis. No striped bass found in larger specimens. Striped bass are c ble of consuming clupeids which are approxim ly 60% of striped bass length. Small bass gener fed on smaller fish which averaged 20% of predator's length. Size availability of forage important factor in Albemarle Sound. Striped preferred the soft-rayed species which gener occurred as juveniles in the sound.--Copy 1973, Biological Abstracts, Inc.
W76-11522

2J. Erosion and Sedimentation

PHOSPHORUS MOBILITY IN LAKE ONTARIO SEDIMENTS,
Wisconsin Univ., Madison. Water Chemistry Lab.
For primary bibliographic entry see Field 5B.
W76-11288

THE STRATIGRAPHY OF NORTHERN LAKE SUPERIOR LATE-GLACIAL AND POSTGLACIAL SEDIMENTS.
Canada Centre for Inland Waters, Burlington (Ontario),
C. I. Dell.
In: Proceedings, Seventeenth Conference on Great Lakes Research, Part 1; McMaster University, Hamilton (Ontario), August 12-14, 1974. International Association for Great Lakes Research, p 179-192, 1974. 10 fig, 16 ref.

Descriptors: *Lake sediments, *Stratigraphy, *Sedimentation, *Lake Superior, Lakes, Sediments, Glacial sediments, Pleistocene epoch, Geologic history, Geology, Clays, Till, Cores, Onsite investigations, Unconsolidated sediments, Sedimentology.
Identifiers: *Post-glacial sediments, *Northern Lake Superior.

This study described the stratigraphy of unconsolidated sediments in Lake Superior north of latitude 48 deg. The study area consisted of three major offshore topographic basins in addition to several shallow shoal and shelf areas. The basins contain lacustrine sediments with a maximum thickness of about 20 m. Postglacial fine-grained sediments consisting primarily of noncalcareous dark gray silty clays range in thickness up to a maximum of 9 m. They overlie glaciolacustrine sediments with a maximum thickness of about 15 m. The dominant glaciolacustrine sediments are gray calcareous varved clays commonly separated from the underlying till by a thin sequence of silty clays or sands. Reddish brown sandy calcareous till underlies much of northern Lake Superior with a gray clayey calcareous till present only in northeastern part. The tills and glaciolacustrine sediments are exposed on the lake floor most commonly in shallower water on the fringes of the topographic basins and on shoals within the basins. In these areas they may be undergoing erosion with transport and redeposition of the sediment in deeper water. The postglacial fine-grained sediments are generally found only in the basins where their accumulation appears to be related not only to water depth but also to local topography. (See also W76-11275) (Sims - ISWS)
W76-11289

GROYNE STABILIZATION OF SLOPE MOVEMENTS AND TOE EROSION, LAKE HURON NEAR BAYFIELD, ONTARIO,
University of Western Ontario, London. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W76-11290

BIOLOGICAL TRANSFORMATION OF CLAY-SIZED SEDIMENTS IN SIMULATED AQUATIC ENVIRONMENTS,
Guelph Univ. (Ontario), Dept. of Land Resource Science.
G. J. Wall, L. P. Wilding, and R. H. Miller.
In: Proceedings, Seventeenth Conference on Great Lakes Research, Part 1; McMaster University, Hamilton (Ontario), August 12-14, 1974. International Association for Great Lakes Research, p 207-211, 1974. 4 fig, 14 ref.

Descriptors: *Sediments, *Clays, *Sewage, Biological properties, Laboratory tests, Lakes, Biodegradation, Microbial degradation, Anaerobic digestion, Cations, Microorganisms, Biological communities, Soils, Sedimentation, Limnology, Lake sediments.

A laboratory study was initiated to investigate the potential for biologically induced transformations of clay-sized sediments under simulated slack and flowing water conditions of the natural freshwater environment. Soil clay materials (less than 2 micrometers) representing surface, subsurface and geologic materials were equilibrated with distilled water and sewage effluents in both static and dynamic environments for periods up to two months. The following analyses were conducted weekly: enumeration of microorganisms, reaction (pH), potassium, silicon, aluminum, electrical conductivity and clay mineralogy. The results of this study indicated that in dynamic systems of clay-sewage and clay-water suspensions, the transformation of the clay material was minimal and within errors of determination. The static systems of clay-sewage, particularly with clay materials from the geologic substratum showed consistent time trends in the parameters measured. The following time trends were observed: an increasing microbial population; slightly increased pH; decreased mica, expandables, and vermiculite; increased quartz and chlorite; increased silica in solution; and decreased potassium in solution. These combined data suggested that the clay-sized sediment had been altered. It was concluded that the environment found most conductive to sediment alteration was one with a high microbial population, a carbonate substrate, and static water (anaerobic) conditions. (See also W76-11275) (Sims - ISWS)
W76-11291

STUDIES OF PLUTONIUM CYCLING AND SEDIMENTATION IN LAKE MICHIGAN,
Argonne National Lab., Ill. Radiological and Environmental Research Div.
For primary bibliographic entry see Field 5B.
W76-11292

OCCURRENCE OF AS, CD, CO, CR, CU, FE, HG, NI, SB, AND ZN IN LAKE ERIE SEDIMENTS,
Bowling Green State Univ., Ohio. Dept. of Geology.
For primary bibliographic entry see Field 5B.
W76-11293

POLLUTANT MERCURY AND SEDIMENTATION IN THE WESTERN BASIN OF LAKE ERIE,
Bowling Green State Univ., Ohio. Dept. of Geology.
For primary bibliographic entry see Field 5B.
W76-11294

STREAM SEDIMENT COMPOSITION: AN AID TO WATER QUALITY ASSESSMENT,
Imperial Coll. of Science and Technology, London (England). Applied Geochemistry Research Group.
For primary bibliographic entry see Field 5A.
W76-11367

HEAVY MINERALS IN THE SANDS OF SOUTHERN AND EASTERN LAKE ONTARIO,
Rochester Univ. N. Y. Dept. of Geological Sciences.
B. W. Selleck.
In: Proceedings, Seventeenth Conference on Great Lakes Research, Part 2; McMaster University, Hamilton (Ontario), August 12-14, 1974. International Association for Great Lakes Research, p 697-703, 1974. 5 fig, 1 tab, 16 ref.

Descriptors: *Sands, *Mineralogy, *Lake Ontario, Sediments, Sedimentology, Beaches, Lakes, Shores, Sampling, Surveys, Rocks, Erosion, Sedimentation.
Identifiers: *Sand sources, Magnetic heavy minerals, Monoclinic pyroxene, Hypersthene, Garnets.

The magnetic heavy mineral fraction of samples of sand-size sediment from the beaches and offshore sand bodies of southern and eastern Lake Ontario has been analyzed to determine variability in the mineral assemblage resulting from longshore transport and associated sedimentary processes. In the samples examined, the ratio of monoclinic pyroxene to hypersthene progressively decreased from west to east along the southern shore. This variation is produced by the dilution of a monoclinic pyroxene-rich suite by a hypersthene-rich suite during easterly transport of sand. The monoclinic pyroxene-rich suite is derived, at least in part, form the large subaqueous sand body offshore of the Niagara River mouth in Lake Ontario. The hypersthene-rich suite is derived from the erosion of shoreline and subaqueous tills along the western New York shore. Other significant variations noted were: (1) relative enrichment of hornblende in lake sands, compared with beach sands; (2) magnetically susceptible rock fragments are most abundant in the separate of samples from the Mexico Bay-Stony Point sands; and (3) the ratio of purple-colorless to red-orange garnet is higher in lake sands than in beach sands. (See also W76-11424) (Sims - ISWS)
W76-11431

FALLOUT 137CS IN THE SOILS AND SEDIMENTS OF THREE SMALL WATERSHEDS,
Agricultural Research Service, Oxford, Miss. Sedimentation Lab.
For primary bibliographic entry see Field 5B.
W76-11453

SCOUR AND FILL PATTERNS IN POOL-RAPID RIVERS,
Arizona Univ., Tucson. Dept. of Civil Engineering and Engineering Mechanics.
E. Silverston.
Master of Science Thesis, 1975. 85 p, 36 fig, 1 tab, 7 ref, 1 append.

Descriptors: *Scour, *River flow, *River systems, *Deposition(Sediments), *River forecasting, River beds, Open channel flow, Colorado River, Model studies, Flow rates, Equilibrium, Hydrograph analysis.
Identifiers: *Pool-rapid rivers.

Analyzes are presented of scour and fill patterns of a pool-rapid river and how these vary with sediment supply, river width, slope and depth, sediment sizes, downstream rapids, changes in flow rate and bed roughness. The analysis predicts patterns for an imaginary model of a portion of a river with characteristics like those of the Colorado. Results verified that a change in flow indicates pool bed fluctuation by scouring or filling and that the time period until equilibrium varies by several orders of magnitude. With an increase in flow the equilibrium depth increases faster than the head on the control; therefore, pools scour if the flood continues long enough. Fill can be expected along the bed as the flow decreases. A downstream pool following several other pools will scour and fill many times before scouring to equilibrium, since a pool cannot reach equilibrium until all those upstream have. Scour holes and fill mounds remain in the system if the hydrograph time period is less than the time necessary for equilibrium to occur. The pool-rapid river is compared with less complex systems to define its special characteristics. (Jahns-Arizona)
W76-11511

SEDIMENT YIELD AS RELATED TO A STOCHASTIC MODEL OF EPHERMERAL RUNOFF,
Agricultural Research Service, Tucson, Ariz. Southwest Watershed Research Center.
K. G. Renard, and L. J. Lane.
In: Present and Prospective Technology for Predicting Sediment Yield and Sources, Proceedings of the Sediment Yield Workshop, November 28-

UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN

30, 1972, U.S. Department of Agriculture Laboratory, Oxford, Mississippi, p 253-263. 10 fig, 3 tab, 24 ref.

Descriptors: *Sediment yield, *Mathematical models, *Ephemeral streams, *Runoff forecasting, Rainfall-runoff relationships, Sediment transport, Stochastic processes, Synthetic hydrology, Watershed management, Arizona.
Identifiers: *Stochastic runoff model, Walnut Gulch Experimental Watershed(Ariz).

A description is presented of a sediment-yield model for ephermal streams, incorporating a stochastic model of runoff with a deterministic sediment-transport relation. The model was developed and verified with field data from the Walnut Gulch Experimental Watershed in southeastern Arizona. The stochastic and sediment-transport models are described. Comparisons between observed and synthetic runoff data indicate that the model produces data comparable to observed facts except for season length variability; however, the mean season length values correspond. Log-normal distributions were fitted to the synthetic annual runoff and sediment data produced with this model. A plot of annual runoff volumes for 50-year sequences of synthetic data on each of two watersheds is graphed and analyzed, with a similar plotting of synthetic annual sediment-yield data. Sediment and runoff volumes for any probability were greater for the larger watershed although the mean annual runoff was less. Possible applications and limitations of the model are discussed and recommendations for future work outlined. (Jahns-Arizona)
W76-11512

HUTTON'S SHEARWATERS INITIATING LOCAL SOIL EROSION IN THE SEAWARD KAIKOURA RANGE,
Forest and Range Experiment Station, Rangiora (New Zealand).
G. R. Evans.
N Z J Sci. 16(3), p 637-642, 1973.

Descriptors: Grasses, Erosion, *Soil erosion, *Vegetation effects, *Turf grasses, Deer, Goats.
Identifiers: Chamois, Chionochloa, *New Zealand, Puffinus-Buttoni, *Shearwaters, Snowgrass swards, Sea birds.

When Hutton's shearwaters (Puffinus buttoni) first occupy a new nesting site the initial destruction of the snowgrass sward (Chionochloa spp.) is rapid. With the continued destruction of these sites by the shearwaters, aided by goats, deer and chamois, the snowgrass swards are killed; this allows severe erosion to proceed at high altitudes in the Seaward Kaikoura Range (New Zealand).--Copyright 1974, Biological Abstracts, Inc.
W76-11518

2K. Chemical Processes

AN INVESTIGATION OF THREE METHODS FOR THE DETERMINATION OF SUB-MICROMOLAR ION CONCENTRATIONS IN WATER,
Wisconsin Univ., Madison. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W76-11331

STREAM SEDIMENT COMPOSITION: AN AID TO WATER QUALITY ASSESSMENT,
Imperial Coll. of Science and Technology, London (England). Applied Geochemistry Research Group.
For primary bibliographic entry see Field 5A.
W76-11367

SIMPLIFIED KJELDAHL NITROGEN DETERMINATION FOR SEAWATER BY A SEMIAUTOMATED PERSULFATE DIGESTION METHOD,
Suffolk County Dept. of Environmental Control, Hauppauge, N.Y.
For primary bibliographic entry see Field 5A.
W76-11396

MICROGRAM DETERMINATION OF BORON IN SURFACE WATERS BY ATOMIC EMISSION SPECTROMETRY,
Utah State Div. of Health, Salt Lake City. Bureau of Labs.
For primary bibliographic entry see Field 5A.
W76-11397

GROUND-WATER RESOURCES AND WATER USE IN SOUTHERN NAVAJO COUNTY, ARIZONA,
Geological Survey, Tucson, Ariz.
For primary bibliographic entry see Field 2F.
W76-11410

HYDROLOGIC RECORDS FOR LAKE COUNTY, FLORIDA, 1973-74,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 7C.
W76-11414

THE NATIONAL STREAM QUALITY ACCOUNTING NETWORK,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 5A.
W76-11419

THE VOLUMETRIC PROPERTIES OF H20--A GRAPHICAL PORTRAYAL,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 1A.
W76-11420

WETTABILITY OF HUMIC ACID AND ITS SALTS,
M. Tschapek, and G. P. Ardizzi.
Z Pflanzenernaehr Bodenkd. 135(1), p 16-31, 1973.

Descriptors: *Wettability, *Humic acid, Salts, Organic compounds, Ions, Pollutant identification.
Identifiers: *Humates, Humic-Acid.

Homoionic humates are readily wetted by hydrocarbons (apolar liquid) and water (polar liquid). By wetting with hydrocarbons low heats of immersion (or wetting) are registered, whereas by wetting with water high heats of immersion are registered and colloidal solutions are formed. Humic acid is wetted by hydrocarbons, producing low heats. It floats on the water surface, and produces the heat of immersion. The surfaces of humic acid and humate are covered by hydrophilic and hydrophobic sites. Humic acid and humate contain about 2 hydrophobic sites/100A2.--Copyright 1974, Biological Abstracts, Inc.
W76-11421

WATER QUALITY OF STREAMFLOW FROM PONDEROSA PINE FOREST WATERSHEDS ON SEDIMENTARY SOILS,
Arizona Univ., Tucson. School of Renewable Natural Resources.
For primary bibliographic entry see Field 5A.
W76-11490

RATIONALIZATION OF IONIC STRENGTH AND CATION EFFECTS ON PHOSPHATE SORPTION BY SOILS,
Massey Univ., Palmerston North (New Zealand). Dept. of Soil Science.
For primary bibliographic entry see Field 2G.
W76-11507

STUDY OF WATER SORPTION ON BIOPOLYMERS, (IN RUSSIAN)
Politekhnicheskii Institut, Leningrad (USSR). c
N. I. Gamayunov, I. Y. Vasil'eva, and V. M. Koshkin.
Biofizika 20(1), p 38-40, 1975.

Descriptors: *Sorption, *Polymers, Moisture content, *Nuclear magnetic resonance, Cellulose, Analytical techniques, Adsorption, Conductivity.
Identifiers: *Biopolymers, *Dielectric studies, Starch, Gelatin.

NMR spin echo and dielectric studies of water in biopolymers were carried out. The data on the relationship between the time of spin-spin relaxation, the energy of movement activation and electroconductivity, and moisture-content indicate that water sorption on biopolymers e.g. gelatin, starch, cellulose, up to a certain humidity value, takes place in a vacuum. With an increase of moisture-content the proces of sorption may be presented as a solution of low-molecular substance in a high-molecular one.--Copyright 1975, Biological Abstracts, Inc.
W76-11532

THE STATISTICAL APPROACH TO THE STUDY OF THE SMALL RIVERS HYDROCHEMICAL REGIME IN WESTERN POLESYE OF THE UKRAINIAN SSR, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Instytut Hydrobiologii.
For primary bibliographic entry see Field 5A.
W76-11536

EVOLUTION OF THE CATIONS INVOLVED IN RAIN, CANOPY LEACHATE AND DRAINAGE WATER THROUGH A FOREST ECOSYSTEM, (IN FRENCH),
Washington Univ., Seattle. Coll. of Forest Resources.
For primary bibliographic entry see Field 2G.
W76-11540

RAPID DETERMINATION OF NO3 IN WATER, (IN ROMANIAN),
Institutul Agronomic, Bucharest (Rumania).
For primary bibliographic entry see Field 5A.
W76-11559

DECREASE OF STRONTIUM-90 CONTENT IN THE TUNDRA SOIL-VEGETATION COVER, (IN RUSSIAN),
Ural Science Center, Sverdlovsk (USSR). Inst. of Plant and Animal Ecology.
N. V. Kulikov, and I. V. Molchanova.
Ekologiya 5(2), p 69-70, 1974.

Descriptors: *Strontium radioisotopes, *Tundra, Vegetation, Soil analysis, Soil water, Plant physiology, Surface waters, Bogs.
Identifiers: *Strontium-90, *USSR, *Biogecoenoses.

Data are presented on the change of Sr90 content in the soil and plants of the subarctic tundra between 1966 and 1970. During this period the total content of the radionuclide in tundra plants dropped from 53-17% in the soil-vegetation cover and from 14-5% in the bog. This decrease of Sr90 concentration in plants should have resulted in an increase of its content in the upper soil layers. Sr90 concentration in the soil did not increase but rather decreased. This was attributed to the removal of the radionuclide from biogeocoenoses by surface and soil waters.--Copyright 1976, Biological Abstracts, Inc.
W76-11565

2L. Estuaries

ROCEEDINGS OF THE SOUTHEASTERN CONFERENCE ON WATER SUPPLY AND WASTEWATER IN COASTAL AREAS,
lorth Carolina Water Resources Research Inst., aleigh.
or primary bibliographic entry see Field 5D.
W76-11224

VATER SUPPLY AND WASTEWATER ISPOSAL - PLANNING AND PROBLEMS - IN OASTAL AREAS,
esen (Henry von) and Associates, Inc., Wilmington, N. C.
or primary bibliographic entry see Field 5D.
W76-11225

OCEAN OUTFALL DISPOSAL SYSTEMS,
ngineering-Science, Inc., Berkeley, Calif.
or primary bibliographic entry see Field 5D.
W76-11226

HE ROLE OF CONVENTIONAL WASTE-VATER TREATMENT IN COASTAL AREAS,
lorth Carolina Univ. at Chapel Hill. Wastewater esearch Center.
or primary bibliographic entry see Field 5D.
W76-11229

UMMARY: TECHNOLOGICAL ALTERNATIVES FOR WATER SUPPLY AND WASTE-VATER DISPOSAL IN THE COASTAL AREA,
lemson Univ. S. C. Dept. of Civil Engineering.
or primary bibliographic entry see Field 5E.
W76-11230

FFECTS OF WATER QUALITY ON THE ECREATIONAL USE OF WATER IN SOUTH AST TEXAS,
amar Univ., Beaumont, Tex. Dept. of Industrial ngineering.
or primary bibliographic entry see Field 5G.
W76-11335

CUTE TOXICITIES OF SPRUCE AND HEMOCK BARK EXTRACTS TO SOME STUARINE ORGANISMS IN SOUTHEASTERN LASKA,
laska Dept. of Fish and Game, Petersburg.
or primary bibliographic entry see Field 5C.
W76-11393

OCUMENTATION FOR ES001. A STEADY-TATE, ONE DIMENSIONAL, ESTUARINE ATER QUALITY MODEL,
nvironmental Protection Agency, New York. Region II.
or primary bibliographic entry see Field 5B.
W76-11460

ROCEEDINGS OF THE SYMPOSIUM ON FFSHORE OIL POTENTIAL AND RELATED AND USE IMPACTS IN THE CENTRAL ALIFORNIA COASTAL ZONE.
lifornia Univ., Santa Cruz, Coastal Marine Lab.
or primary bibliographic entry see Field 6G.
W76-11461

HE ALERT BAY OIL SPILL: A ONE-YEAR UDY OF THE RECOVERY OF A CONMINATED BAY,
vironment Canada, Victoria, B. C. (Canada). arine Sciences Directorate, Pacific Region.
or primary bibliographic entry see Field 5C.
W76-11463

TEXAS COASTAL MANAGEMENT PROGRAM. HEARING DRAFT. EXECUTIVE SUMMARY.
Texas General Land Office, Austin.
For primary bibliographic entry see Field 6B.
W76-11465

TEXAS COASTAL MANAGEMENT PROGRAM. HEARING DRAFT.
Texas General Land Office, Austin.
For primary bibliographic entry see Field 6B.
W76-11466

TEXAS COASTAL MANAGEMENT PROGRAM. HEARING DRAFT. APPENDICES.
Texas General Land Office, Austin.
For primary bibliographic entry see Field 6B.
W76-11467

FLORIDA COASTAL POLICY STUDY: THE IMPACT OF OFFSHORE OIL DEVELOPMENT,
Florida State Univ., Tallahassee. Dept. of Urban and Regional Planning.
For primary bibliographic entry see Field 6G.
W76-11468

DEEPWATER PORTS: POLICY ISSUES IN FLORIDA,
Florida State Univ., Tallahassee Dept. of Urban and Regional Planning.
For primary bibliographic entry see Field 6G.
W76-11473

BUREAU OF LAND MANAGEMENT'S ENVIRONMENTAL STUDIES PROGRAM FOR THE SOUTH ATLANTIC OUTER CONTINENTAL SHELF AREA. CONFERENCE/WORKSHOP PROCEEDINGS,
Research Triangle Inst., Research Triangle Park, N. C.
For primary bibliographic entry see Field 6G.
W76-11474

FRAMEWORK FOR BUREAU OF LAND MANAGEMENT PROGRAMS,
Bureau of Land Management, Washington, D.C. Outer Continental Shelf Environmental Studies Program.
For primary bibliographic entry see Field 6G.
W76-11476

GEOLOGICAL OCEANOGRAPHY CONSIDERATIONS,
Duke University, Durham, N. C.
For primary bibliographic entry see Field 6G.
W76-11482

PHYSICAL OCEANOGRAPHY CONSIDERATIONS,
State Univ. System of Florida Inst. of Oceanography, St. Petersburg.
For primary bibliographic entry see Field 6G.
W76-11483

BIOLOGICAL CONSIDERATIONS,
Duke Univ., Beaufort, N. C. Marine Lab.
For primary bibliographic entry see Field 6G.
W76-11484

CONCLUSION AND RECOMMENDATIONS CONFERENCE/WORKSHOP,
Skidaway Inst. of Oceanography, Savannah, Ga.
For primary bibliographic entry see Field 6G.
W76-11485

TRANSVERSE DISPERSION IN PARTIALLY STRATIFIED TIDAL FLOW,
California Univ., Berkeley. Dept. of Civil Engineering.
S. M. Sumer.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-256 582, $8.00 in paper copy, $3.00 in microfiche. Report UHM-20, Hydraulic Engineering Laboratory, University of California, Berkeley, California, May 1976. 218 p, 67 fig, 10 tab, 36 ref, 3 append. (California Water Resources Center Project UCAL-WRC-W-486).

Descriptors: *Mixing, *Saline water-freshwater interfaces, Estuaries, Tidal waters, Flow, *Open channel flow, Path of pollutants, *Dispersion, *Stratified flow, *Density stratification, Circulation.
Identifiers: *Transverse dispersion.

This study investigates the transverse mixing characteristics of a tidal open channel flow both for neutrally buoyant flow and a partially stratified flow. The effect of the geometry of the cross-section on lateral mixing is investigated by experiments made in uniform and nonuniform cross-sections. The first part deals with the influence of vertical density stratification on the rate of transverse dispersion without the presence of any transverse circulation. In the second part, the effect of nonuniformity of the cross-sectional area on transverse mixing is investigated; an effect of the nonuniformity is the creation of transverse density gradients and transverse circulation patterns. (Snyder-California, Davis)
W76-11486

FOOD HABITS OF YEARLING AND ADULT STRIPED BASS, MORONE SAXATILIS (WALBAUM), FROM ALBEMARLE SOUND, NORTH CAROLINA,
National Marine Fisheries Service, Beaufort, N. C. Atlantic Estuarine Fisheries Center.
For primary bibliographic entry see Field 2I.
W76-11522

THE IMPORTANCE OF INHIBITING SUBSTANCES IN THE CONTROL OF ALGAL AND BACTERIAL POPULATIONS OF MARINE PLANKTON, (IN FRENCH),
Centre d'Oceanographie, Marseille (France). Station Marine d'Endoume.
For primary bibliographic entry see Field 5G.
W76-11542

EFFECT OF THE DEGREE OF VACUUM USED IN FILTRATION ON THE SIMULTANEOUS MEASUREMENT OF ASSIMILATION AND EXCRETION BY PHYTOPLANKTON ORGANISMS, (IN FRENCH),
Office de la Recherche Scientifique et Technique Outre-Mer, Abidjan (Ivory Coast). Centre de Recherches Oceanographiques.
For primary bibliographic entry see Field 5C.
W76-11554

PRIMARY PRODUCTION IN THE MAURITANIAN UPWELLING IN MARCH 1973, (IN FRENCH),
Office de la Recherche Scientifique et Technique Outre-Mer, Abidjan (Ivory Coast). Centre de Recherches Oceanographiques.
For primary bibliographic entry see Field 5C.
W76-11555

RADIOACTIVITY IN THE MEDITERRANEAN SEA, (IN ITALIAN),
Parma Univ. (Italy). Instituto di Zoologia.
For primary bibliographic entry see Field 5A.
W76-11558

PRIMARY PRODUCTION AND BIOTIC BALANCE OF PLANKTON IN THE

LIBRARY U. OF I. URBANA-CHAMPAIGN

NORTHEASTERN PART OF THE AMUR BAY, (IN RUSSIAN),
Akademiya Nauk SSSR, Vladivostok. Institut Morskogo Biologii.
For primary bibliographic entry see Field 5C.
W76-11576

RELATION BETWEEN GENERATION TIME AND BIOMASS OF PHYTOPLANKTON, (IN RUSSIAN),
Moscow State Univ. (USSR). Dept. of Hydrobiology.
For primary bibliographic entry see Field 5C.
W76-11577

THE DISTRIBUTION OF NUTRIENT SALTS IN THE MORLAIX BAY (FINISTERE, FRANCE): THE ROLE OF BENTHIC ALGAE, (IN FRENCH),
Brussels Univ. (Belgium). Lab. of Oceanography.
For primary bibliographic entry see Field 5B.
W76-11583

SUPERSHRIMP: DEEP BIOTURBATION IN THE STRAIT OF CANSO, NOVA SCOTIA,
McMaster Univ., Hamilton (Ontario). Dept. of Geology.
For primary bibliographic entry see Field 5C.
W76-11584

ORGANIC POLLUTION IN ENSENADA BAY, MEXICO,
Centre d' Oceanographie, Marseille (France). Station Marine d'Endoume.
For primary bibliographic entry see Field 5B.
W76-11587

REDUCTION OF FIELD POPULATIONS OF FIDDLER CRABS BY UPTAKE OF CHLORINATED HYDROCARBONS,
Marine Biological Lab., Woods Hole, Mass
Boston Univ. Marine Program.
For primary bibliographic entry see Field 5C.
W76-11588

PCB LEVELS IN CLYDE MARINE SEDIMENTS AND FAUNA,
Clyde River Purification Board, Glasgow (Scotland).
For primary bibliographic entry see Field 5B.
W76-11589

ANTIMICROBIAL-RESISTANT COLIFORMS IN NEW YORK BIGHT,
Montclair State Coll., Upper Monclair, N. J. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W76-11590

FLUORIDE IN MARINE ANIMALS,
Newcastle-upon-Tyne Univ. (England). Dept. of Plant Biology.
For primary bibliographic entry see Field 5C.
W76-11593

MIDSUMMER METABOLISM OF AN EELGRASS COMMUNITY,
Georgia Univ., Athens. Dept. of Botany.
For primary bibliographic entry see Field 5C.
W76-11594

FINE PARTICLES AND WATER QUALITY IN THE COASTAL MARINE ENVIRONMENT,
State Univ. of New York at Stony Brook. Marine Sciences Research Center.
For primary bibliographic entry see Field 5B.
W76-11612

IMPACT OF WATER SUPPLY AND WASTEWATER ON THE COASTAL AND MARINE ENVIRONMENTS,
North Carolina State Univ., Raleigh. Sea Grant Program.
For primary bibliographic entry see Field 5D.
W76-11625

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

AWT ENERGY NEEDS A PRIME CONCERN,
Orange County Water District, Fountain Valley, Calif. Board of Directors.
For primary bibliographic entry see Field 5D.
W76-11198

REVERSE OSMOSIS PILOT PLANT STUDIES FOR THE PURIFICATION AND REUSE OF EFFLUENT FROM A SANITARY WASTE TREATMENT PLANT,
Rockwell International, Golden, Colo. Rocky Flats Plant.
For primary bibliographic entry see Field 5D.
W76-11267

TREATMENT OF ARMY M U S T FIELD HOSPITAL WASTEWATER FOR WATER REUSE,
Abcor, Inc., Cambridge, Mass. Walden Research Div.
For primary bibliographic entry see Field 5D.
W76-11270

ANNUAL REPORT - VTE/MSF MODULE - FOUNTAIN VALLEY TEST FACILITY, JULY 1, 1975 - APRIL 30, 1976.
Burns and Roe Industrial Services Corp., Paramus, N. J.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-256 572, $7.50 in paper copy, $3.00 in microfiche. Office of Water Research and Technology, Report OWRT/S--76/51, April 1976. 181 p, 50 fig, 42 tab. DOI-14-30-3164 14-34-0001-6518.

Descriptors: *Desalination plants, *Desalination processes, *Distillation, *Heat transfer, Sea water, Operating and maintenance, Corrosion, California, Fouling.
Identifiers: *VTE/MSF Module, *Fountain Valley(Calif), Calcium sulfate, Cuprous oxide.

This is the final report on operation and developmental activities on the VTE/MSF sea water desalting test module at Fountain Valley, California. Because of severe noise, emitted primarily from the boiler area, module operations were restricted to daylight hours, five (5) days a week. Technical data were collected in four (4) modes of operation. Extensive heat transfer data were collected over a temperature range of 110F to 220F and new design equations were developed for the combined VTE/MSF process. Heat transfer coefficients for all four (4) VTE bundles are given. Heat exchanger tube corrosion rates are given for all operating modes. Calcium sulfate and cuprous oxide caused fouling in the VTE bundles. (OWRT)
W76-11325

PROCESS FOR THE REGENERATION OF ION-EXCHANGE RESINS AND APPLICATIONS THEREOF,
Institutul de Proiectari Pentru Industria Chimica Anorganica si Ingrasamintelor, Bucharest (Rumania). (Assignee).
N. M. Arion.
U S Patent No 3,956,115, 7 p, 4 fig, 5 ref. Official Gazette of the United States Patent Office, Vol 946, No 2, p 727, May 11, 1976.

Descriptors: *Patents, *Water purification, *Water treatment, *Desalination, *Demineralization, *Ion exchange, Resins, Anion exchange, Cation exchange.
Identifiers: *Resin regeneration.

The invention relates to a process for the regeneration of cationic and anionic ion exchange resins with concentrated acids or bases, thereby obtaining a concentrated effluent from which the eluate salt and the possible excess of regenerant are advantageously recovered. The concentrations of the acids and bases used in regeneration are much higher than those known as used heretofore. The process is carried out under conditions such that the resin temperature at the regenerant liquid/resin bead interface does not exceed a maximum of about 20C. An important decrease of the heat amount released in regeneration is reached by the removal, prior to introducing the concentrated regenerant, of the water from the ion exchange resin interstices. The elimination of the liquid from the interstices of the ion exchange resin, water or concentrated regenerant, may be performed by blowing-in of compressed air or inert gas, by vacuum suction, by centrifuging, or by combining these two means. The purification and valorization of waste waters and diluted solutions by fixing their components on ion exchangers, that may be regenerated according to the invention, leads not only to their purification. The water resulting as effluent is an advancedly demineralized water of high purity. (Sinha-OEIS)
W76-11447

WIND-SOLAR POWER INSTALLATIONS FOR WATER RAISING AND DISTILLATION, (IN RUSSIAN),
Akademiya Nauk Turkmenskoi SSR, Ashkhabad. Fiziko-Tekhnicheskii Institut.
R. Bairamov, S. Seiitkurbanov, Kh. Khallyev, and V. Agadzhanov.
Probl Osvoeniya Pustyn'. 4, p 71-76, 1974.

Descriptors: *Distillation, Costs, *Desalination plants, Energy, *Solar distillation, Salinity, Water supply, Groundwater, Water yield improvement, Water wells.

Research is proceeding on the designing of arrangements for water raising and distillation utilizing the energy of the sun and wind. Wind-solar power installation in combination with a distillation plant is recommended. Cost/performance is studied in response to the salinity rate and depth of underground waters. Water is to be provided for human consumption and range land production of sheep.--Copyright 1975, Biological Abstracts, Inc.
W76-11524

THE PRINCIPAL ASPECTS OF DESALINATION OF SURFACE WATERS OF THE TROPICAL SOUTHWESTERN PACIFIC, (IN FRENCH),
Office de la Recherche Scientifique et Technique Outre-Mer, Noumea (New Caledonia). Centre ORSTOM de Noumea.
For primary bibliographic entry see Field 2D.
W76-11539

STUDY OF THE EFFECT OF WATER DESALINATED BY ELECTRODIALYSIS ON SOME BIOLOGICAL OBJECTS, (IN RUSSIAN),
Nauchno-Issledovatelskii Institut Selskoi Gigieny, Saratov (Gigieny).
For primary bibliographic entry see Field 5D.
W76-11548

THE AVAILABILITY OF DESALTING FOR WATER SUPPLY FROM SALINE SOURCES,
Office of Water Research an Technology, Washington, D. C.
W. L. Barnes, Jr.
In Proceedings of the Southeastern Conference on Water Supply and Wastewater in Coastal Areas, April 2-4, 1975, Wilmington, North Carolina, University of North Carolina, p 102 110.

Descriptors: *Desalination, *Distillation, *Crystallization, *Reverse osmosis, *Electrodialysis, *Ion exchange, Separation techniques, Desalnation processes, Membranes, Brackish water, Saline water, Freezing, Treatment facilities, Coasts, Florida.
Identifiers: Eutectic freezing.

A review of the state of the art of various desalination processes is presented. These processes fall into two categories: those involving a phase change such as distillation or crystallization and those which remove salts from water in the liquid phase by such mechanisms as reverse osmosis, electrodialysis, or ion exchange. Distillation processes account for about 93% of all desalination activities throughout the world. Membrane processes, along with ion exchange, are historically the preferred methods for desalting brackish waters, though seawater membrane desalting systems operate at a relatively low product water recovery amounting to about 30%. Eutectic freezing offers a process universally acceptable for all types of saline waste streams and does not require pre-treatment. An additional advantage of the process is its high product recovery which amounts to over 99% of the initial saline water treated. The practicality of desalination is being demonstrated in the southeastern coastal states, particularly Florida, where desalting plants are used to treat brackish water. (See also W76-11224) (Kreager-FIRL)
W76-11619

3B. Water Yield Improvement

UNDERGROUND STORAGE OF STATE WATER PROJECT SUPPLY, A PROGRESS REPORT,
Los Angeles City Dept. of Water and Power. Aqueduct Div.
For primary bibliographic entry see Field 4B.
W76-11119

3C. Use Of Water Of Impaired Quality

EFFECT OF DILUTED SEA WATER ON THE BASE STATUS OF AN ACID SOIL,
West Pakistan Agricultural Univ., Lyallpur. Dept. of Soil Sciences.
For primary bibliographic entry see Field 2G.
W76-11131

EXPERIENCES AT PENN STATE WITH LAND APPLICATION,
Pennsylvania State Univ., University Park. School of Forest Resources.
For primary bibliographic entry see Field 5D.
W76-11234

PUERTO RICO: ALONG THE ROUTE OF WATER REUSE,
Environmental Protection Agency, San Juan, Puerto Rico.
For primary bibliographic entry see Field 5D.
W76-11259

INDUCTION OF PLANTS CONDUCIVE TO SALT TOLERANCE,
Colorado State Univ., Fort Collins. Dept. of Botany and Plant Pathology.
M. W. Nabors.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-256 764, $4.50 in paper copy, $3.00 in microfiche. Colorado Environmental Resources Center, Fort Collins, Completion Report Series No. 73, July 1976. 35 p, 4 fig, 2 tab, 79 ref, append. OWRT B-143-COLO (1) 14-31-0001-5142.

Descriptors: *Salts, *Water quality, Water pollution, Agriculture, *Salt tolerance, Plant tissues, Plant physiology, Cytological studies, Plant morphology, Tobacco.
Identifiers: Salt tolerant mutants, Plant mutations.

Much successful work has been done on altering the environment by irrigation to increase the amount of land in agricultural production, however the costs may increase as suitable water becomes more difficult to develop. The alternative may be to adjust the plants to accept lower quality water through selection for appropriate spontaneous mutants. Methods for the selection of desirable spontaneous mutants require the application of environmental pressure to give the mutant a competitive advantage and also require the examination of millions of individual plants. To accomplish this in field trials is time consuming and costly. Instead this project employs individual cells in tissue culture where ten million cells occupy 100 ml and each cell effectively is a plant, because a plant can be regenerated from an individual cell. Plant properties such as salt tolerance which is exhibited on the cellular level can be selected in tissue culture at much less cost due to the small scale required. The focus of this project has been toward the selection of salt tolerant mutants. Two lines of tobacco cells, tolerant to NaCl levels of 8000 ppm, have been selected; normal tolerance to NaCl in this species is 800 ppm. Plants have been regenerated from the tissue cultures at many levels of NaCl tolerance between these extremes, and these plants are currently being tested for NaCl tolerance and for mutation inheritability. Although practical tolerance needs may not exceed 2000-3000 ppm, the higher ranges of salt tolerance may yield mutants with better yields at the moderate tolerance levels. Considerable progress has been made toward tissue culture mutant selection systems for oats, wheat, soybean, corn, and sugar beets. Selection for salt tolerant mutants is currently underway for both oats and wheat.
W76-11494

FERTILIZING DRYLAND GRAIN SORGHUM ON UPLAND SOILS THE 20- TO 26- INCH RAINFALL AREA IN KANSAS,
Kansas State Univ., Hays. Fort Hays Branch Experiment Station.
For primary bibliographic entry see Field 3F.
W76-11516

WIND-SOLAR POWER INSTALLATIONS FOR WATER RAISING AND DISTILLATION, (IN RUSSIAN),
Akademiya Nauk Turkmenskoi SSR, Ashkhabad. Fiziko-Tekhnicheskii Institut.
For primary bibliographic entry see Field 3A.
W76-11524

CHARACTERISTICS OF THE QUALITY OF IRRIGATION WATER ON THE BAGAEVSK-SADKOVSK IRRIGATION SYSTEM, (IN RUSSIAN),
Moscow State Univ. (USSR). Dept. of Soil Science.
For primary bibliographic entry see Field 5B.
W76-11566

DETOXICATION IN PLANTS OF TOXIC SUBSTANCES FROM INDUSTRIAL SEWAGE USED FOR IRRIGATION, (IN RUSSIAN),
Central Research Station Agricultural Use Sewage, Noginsk (USSR).
For primary bibliographic entry see Field 5C.
W76-11567

WASTEWATER REUSE IN COASTAL AREAS,
North Carolina Univ. at Chapel Hill. Dept. of Environmental Sciences and Engineering.
For primary bibliographic entry see Field 5D.
W76-11620

3D. Conservation In Domestic and Municipal Use

MARGINAL POLLUTION ANALYSIS FOR LONG RAGE FORECASTS,
Cornell Univ., Ithaca, N. Y. Center for Urban Development Research.
For primary bibliographic entry see Field 5G.
W76-11127

INTERACTIONS BETWEEN LAND USE AND URBAN WATER RESOURCES PLANNING,
Purdue Univ., Lafayette, Ind. School of Civil Engineering.
For primary bibliographic entry see Field 4A.
W76-11130

VILLAGE WATER SUPPLY, A WORLD BANK PAPER.
International Bank for Reconstruction and Development, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-11143

SYSTEMATIC DEVELOPMENT OF METHODOLOGIES IN PLANNING URBAN WATER RESOURCES FOR MEDIUM SIZE COMMUNITIES. PHASE I. FINAL REPORT,
Purdue University, West Lafayette, Indiana, Water Resources Research Center.
For primary bibliographic entry see Field 6B.
W76-11175

SYSTEMATIC DEVELOPMENT OF METHODOLOGIES IN PLANNING URBAN WATER RESOURCES FOR MEDIUM SIZE COMMUNITIES: REGIONAL AQUIFER EVALUATION STUDIES WITH STOCHASTIC INPUTS,
Purdue University, West Lafayette, Indiana, Water Resources Research Center.
For primary bibliographic entry see Field 6B.
W76-11176

SYSTEMATIC DEVELOPMENT OF METHODOLOGIES IN PLANNING URBAN WATER RESOURCES FOR MEDIUM SIZE COMMUNITIES: POPULATION CHARACTERISTICS AND RESIDENTIAL WATER USE,
Purdue Univ., Lafayette, Ind. Dept. of Sociology and Anthropology.
For primary bibliographic entry see Field 6B.
W76-11177

PROCEEDINGS OF THE THIRD NATIONAL CONFERENCE ON COMPLETE WATERUSE: SYMBIOSIS AS A MEANS OF ABATEMENT FOR MULTI-MEDIA POLLUTION,
For primary bibliographic entry see Field 5D.
W76-11257

AN ECONOMETRIC FORECASTING MODEL FOR THE MAJOR METROPOLITAN AREAS IN THE LAKE ERIE BASIN,
Case Western Reserve Univ., Cleveland, Ohio. Dept. of Economics.
For primary bibliographic entry see Field 5B.
W76-11322

PROCESS WASTEWATER: RECLAMATION OR DISPOSAL,
Sandwell International Inc., Atlanta, Ga.
For primary bibliographic entry see Field 5D.

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W76-11376

WICHITA FALLS INTEGRATED MUNICIPAL INFORMATION SYSTEM, WATER UTILITY PROCESSING SYSTEM (WUPS), APPLICATION COMPLETION REPORT, VOLUME I.
Available from the National Technical Information Service, Springfield, Va 22161, PB-247 781, $12.00 in paper copy, $3.00 in microfiche. Report USAC WFT2-5019, June, 1975. 789 p, 14 fig, 9 append.

Descriptors: *Local governments, *Cost-benefit analysis, *Documentation, *Cities, *Municipal water, Sewerage, Computers, Water resources, *Texas, Computer programs.
Identifiers: *Information systems, *Urban Information Systems Interagency Committee, *Wichita Falls(Tex), *Water Utility Processing System.

An Urban Information Systems Inter-Agency Committee (USAC) Project in Wichita Falls, Texas, applies computer use to the full range of municipal functions. It is divided into several systems, including the Water Utility Processing System (WUPS), designed to support Wichita Falls in selling its water resources with associated services. The system is designed to provide for determining the cost of refuse, water, sewer, and assessment services, billing each customer, and collecting payment on the accounts. The hardware for the system includes an International Business Machines (IBM) 370/145 computer, storage devices, five tape drives, a reader/punch, 19 video terminal devices, and a cartridge reader. The software consists of IBM's Disk Operating System/Virtual Storage (DOS/VS), IBM's Customer Information Control System (CICS) for telecommunications, and a spooling system. (See also W76-11597) (Snyder-FIRL)
W76-11596

WICHITA FALLS INTEGRATED MUNICIPAL INFORMATION SYSTEM, WATER UTILITY PROCESSING SYSTEM (WUPS), APPLICATION COMPLETION REPORT, VOLUME II.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-247 782, $18.75 in paper copy, $3.00 in microfiche. Report USAC WFT2-5020, June, 1975. 433 p, 34 fig, 79 tab.

Descriptors: *Local governments, *Cost-benefit analysis, *Documentation, *Cities, *Municipal water, Sewerage, Computers, Water resources, *Texas, Computer programs.
Identifiers: *Information systems, *Urban Information Systems Interagency Committee, *Wichita Falls(Tex), *Water Utility Processing System.

An Urban Information Systems Inter-Agency Committee (USAC) Project in Wichita Falls, Texas, applies computer use to the full range of municipal functions. It includes the Water Utility Processing System (WUPS), which supports Wichita Falls in selling its water resources with associated services. The purpose of the system is determining the cost of refuse, water, sewer, and assessment services, billing each customer, and collecting payment on the accounts. Volume II contains the appendix on User Department procedures, which completes the description of this system. It contains procedures describing processes performed by User Department personnel for the functions developed for the system. The hardware for the system includes an International Business Machines (IBM) 370/145 computer, storage devices, five tape drives, a reader/punch, 19 video terminal devices, and a cartridge reader. The software consists of IBM's Disk Operating System/Virtual Storage (DOS/VS), IBM's Customer Information Control System (CICS) for telecommunications, and a spooling system. (See also W76-11596) (Snyder-FIRL)
W76-11597

URBAN STORMWATER MANAGEMENT MODELING AND DECISION-MAKING,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
For primary bibliographic entry see Field 5D.
W76-11599

WATER QUALITY MANAGEMENT PLANNING FOR URBAN RUNOFF.
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5D.
W76-11600

3E. Conservation In Industry

PROCEEDINGS OF THE THIRD NATIONAL CONFERENCE ON COMPLETE WATERUSE: SYMBIOSIS AS A MEANS OF ABATEMENT FOR MULTI-MEDIA POLLUTION,
For primary bibliographic entry see Field 5D.
W76-11257

REMOVAL AND RECOVERY OF AMMONIA FROM ANAEROBIC DIGESTER SUPERNATANT,
CH2M/Hill, Redding, Calif.
For primary bibliographic entry see Field 5D.
W76-11260

UNION CARBIDE'S REUSE OF SEWAGE WATER,
Carbide Chemicals Co., Bombay, India.
For primary bibliographic entry see Field 5D.
W76-11261

WASTEWATER RECYCLE - THE PROPER APPROACH TO EVALUATION OF DISPOSAL VERSUS REUSE,
Ecodyne Corp., Union, N. J. Industrial Waste Treatment Div.
For primary bibliographic entry see Field 5D.
W76-11263

PROCESS WASTEWATER: RECLAMATION OR DISPOSAL,
Sandwell International Inc., Atlanta, Ga.
For primary bibliographic entry see Field 5D.
W76-11376

THE EFFLUENT-FREE BLEACHED KRAFT PULP MILL. PART VI. SUBSTANTIAL SUBSTITUTION OF CHLORINE DIOXIDE FOR CHLORINE IN THE FIRST STAGE OF BLEACHING,
Toronto Univ. (Ontario). Dept. of Chemical Engineering.
W. H. Rapson, C. B. Anderson, and D. W. Reeve.
In: TAPPI Alkaline Pulping Conference, Williamsburg, Virginia, October 27-29, 1975, Preprinted Proceedings (TAPPI, Atlanta, Georgia), p 177-188. 3 fig, 5 ref, 6 tab.

Descriptors: *Water pollution control, *Bleaching wastes, Pulp and paper industry, Water pollution sources, Chlorine, Toxicity, Biochemical oxygen demand, Chemical oxygen demand, Chlorides, Color, Acidity, Corrosion, Closed conduit flow, Pollution abatement, Canada, Foreign countries, Sodium chloride.
Identifiers: Kraft mills, *Chlorine dioxide, Sodium hydroxide, Closed systems.

Studies showed that substantial substitution of chlorine dioxide for chlorine in the first stage of kraft pulp bleaching improves pulp yield, strength, color stability, and cleanliness. Bleach plant effluent properties are also greatly improved; with 70% replacement, color is decreased by about one-half, toxicity is nearly eliminated, BOD and COD are decreased 15-20% and chloride content is decreased to one-half that found with 100% chlorine in the first stage. The NaOH required for extraction is decreased substantially, and in an effluent free mill it is decreased to one-half compared with all chlorine. As chlorine dioxide is substituted for chlorine, acidity and chloride concentration are decreased, thereby decreasing corrosivity. When pollution is eliminated by introducing bleach plant effluent into the recovery system, 70% replacement of chlorine by chlorine dioxide decreases to one-half the quantity of NaCl introduced into the pulping chemical recovery cycle. The new closed-cycle bleached kraft pulp mill now under construction at Great Lakes Paper Co., Thunder Bay, Ontario, is designed to use a mixture of 70% chlorine dioxide and 30% chlorine to supply the necessary available chlorine in the first bleaching stage. (See also W74-07379, W74-07378, and W74-05275) (Witt-IPC.)
W76-11382

HANDLING AND DISPOSAL OF BLEACH PLANT EFFLUENTS,
Longview Fibre Co., Wash.
For primary bibliographic entry see Field 5D.
W76-11383

WATER REUSE AND RECYCLE IN THE C(D)EHDED BLEACH SEQUENCE,
CIP Research Ltd., Hawkesbury (Ontario).
J. A. Histed, and F. M. A. Nicolle.
In: TAPPI Alkaline Pulping Conference, Williamsburg, Virginia, October 27-29, 1975, Preprinted Proceedings (TAPPI, Atlanta, Georgia), p 167-176. 3 fig, 5 ref, 6 tab.

Descriptors: *Bleaching wastes, *Water reuse, *Pulp and paper industry, Water pollution sources, Wastes, Industrial wastes, Water pollution control, *Recycling, Waste treatment, Wastewater treatment, Industrial water, Effluents, Water conservation.
Identifiers: Wash water, Washing(Pulp), Countercurrent washing.

The low temperature normally associated with the hypochlorite stage of the C(D)EHDED bleach sequence has presented a serious obstacle to direct countercurrent pulp washing. This study demonstrates that the hypochlorite stage can be operated at 80C (176 F) in a tight countercurrent washing system with no adverse effect on the properties of the fully bleached pulp. Extensive recycling of the chlorination filtrate reduced the volume of effluent from the chlorination washer to 491 gallons/air-dry ton. The total effluent from the EHDED stages was reduced to 976 gallons/air-dry ton by means of a tight countercurrent washing system. This represents a 10-fold reduction in effluent volume when compared with the present-day practice of most mills using this bleaching sequence. (Witt-IPC)
W76-11385

IMPROVED SYSTEM FOR THE PURIFICATION OF WASTE WATERS AT THE LVOV BOARD MILL (UDOSKONALENA SKHEMA OCHISTKI STICHNIKH VOD LVIVS'KIIKARTONI FABRITSI,
For primary bibliographic entry see Field 5D.
W76-11392

POLLUTION MANAGEMENT IN THE PAPER AND PAPERBOARD INDUSTRY.
For primary bibliographic entry see Field 5G.
W76-11400

LEGAL INSTITUTIONS FOR THE ALLOCATION OF WATER AND THEIR IMPACT ON COAL CONVERSION OPERATIONS IN KENTUCKY,
Kentucky Univ., Lexington.
For primary bibliographic entry see Field 6E.

/76-11489

ACTERIAL AND COLIFORM COUNTS IN HE WATER SUPPLY OF SLAUGHTER OUSES SITUATED IN THE VICINITY OF ALVADOR-BAHIA: BRIEF NOTE, (IN PORTUUESE),
niversidade Federal da Bahia, Salvador (Brazil).
or primary bibliographic entry see Field 5A.
/76-11525

F. Conservation In Agriculture

NERGY REDUCTION THROUGH IMPROVED RRIGATION PRACTICES,
ebraska Univ., Lincoln. Dept. of Agricultural ngineering.
R. Gilley, and D. G. Watts.
vailable from the National Technical Informaon Service, Springfield, Va., 22161, as PB-256 8, $4.00 in paper copy, $3.00 in microfiche. resented at Energy and Agriculture Conference, . Louis, Missouri, June 16-19, 1976. (1976). 26 p, fig, 4 tab, 22 ref. OWRT A-0380NEB(1), 14-34-01-6028.

escriptors: Irrigation, Management, Energy, onservation, *Irrigation systems, *Water utilizaon, Pumping, *Pumping plants, *Irrigation praces, *Water conservation, Soil moisture, Irrigaon efficiency, Costs.
entifiers: *Energy conservation.

ecause irrigation is such a large consumer of the tal energy used in production agriculture, reducn of the energy used to pump water can have a nificant impact on agriculture's energy requirents. This energy requirement can be lessened reducing the amount of water pumped, improvg the irrigation efficiency, improving the pumpg plant performance and lowering the pressure quirements. Water and energy conservation are cussed relative to current irrigation practices d existing technology. Several possible areas are scribed where potential energy savings exist. e design of new equipment and improved nagement of irrigation systems will provide hniques to conserve both water and energy. ese energy saving techniques can be used to ine a continued high level of production in the e of energy shortages, cost increases and ited water. Pump irrigators in the future may ve to accept soil moisture deficits and the result reduced yields in some years because of short rgy supplies and scheduled electrical power inruptions.
6-11109

FECTS OF SULFUR DIOXIDE AND/OR ONE ON SEVERAL OAT VARIETIES, 1975 NUAL REPORT,
rth Carolina State Univ., Raleigh.
primary bibliographic entry see Field 5C.
/6-11190

ND DISPOSAL OF WASTEWATER,
rth Carolina State Univ., Raleigh. Dept. of logical and Agricultural Engineering.
primary bibliographic entry see Field 5E.
5-11227

ND APPLICATION OF WASTEWATER.
ironmental Protection Agency, Philadelphia, Region III.
primary bibliographic entry see Field 5D.
-11231

UADRATIC PROGRAMMING APPROACH THE PRODUCTION OF CALIFORNIA

FIELD AND VEGETABLE CROPS EMPHASIZING LAND, WATER AND ENERGY USE,
California Univ., Davis. Dept. of Agriculture Economics.
R. M. Adams.
Available from the National Technecial Information Service, Springfield, Va 22161, PB-256 594, $9.25 in paper copy, $3.00 in microfiche. Doctoral Dissertation, August 1975. 345 p, 10 fig, 52 tab, 115 ref. (California Water Resources Center Project UCAL-WRC-W-483).

Descriptors: *Energy, *Economics, *Economic efficiency, Supply, Demand, *California, Land use, Water utilization, *Crop production, Costs, Fuels, Fertilizers, Farm management, Forecasting, Field crops, Vegetable crops, Alternative costs, Prices.
Identifiers: Quadratic programming, Economics models.

California agriculture is continually adjusting to changing demand and supply conditions, but the events associated with the 'energy crisis' of 1973-74 appeared as an abrupt shift in production conditions rather than a random shock or a gradual trend in events of the past. An additional shock was adverse weather conditions in several important grain producing areas of the world resulting in increasing concern over food supplies both here and abroad, and the associated inflation due to rising food and energy prices. This thesis explores the effects of increases in energy costs (gasoline and diesel fuels) and energy-based inputs (nitrogen fertilizer) on the cropping pattern in California for an important set of commodities including major vegetable and field crops under alternative assumptions as to demand for the commodities. (Snyder - California, Davis)
W76-11326

EFFECTS OF WATER STRESS UNDER CONTRASTING ENVIRONMENTAL CONDITIONS ON TRANSPIRATION AND PHOTOSYNTHESIS IN SOYBEAN,
Department of Scientific and Industrial Research, Palmerston North (New Zealand) Plant Physiology Div.
M. F. Beardsell, K. J. Mitchell, and R. G. Thomas.
J Exp Bot. 24(80), p 579-586, 1973.

Descriptors: *Transpiration, *Photosynthesis, *Soybeans, Temperature, Stomata, Soil water, Root systems.
Identifiers: Glycine-Max, Mesophyll.

Continuous and simultaneous measurements of CO2 exchange and transpiration rates of whole soybean plants were made under contrasting, controlled environmental conditions when water stress was imposed by withholding H2O. Daytime temperatures and vapor pressure deficits were 27.5C/12 mbar; 27.5C/5 mbar; 22.5C/12 mbar, and 22.5C/5 mbar. The experimental conditions were virtually the same as the conditions under which the plants had been grown. Under all 4 treatments photosynthesis and transpiration rates were closely correlated as water stress increased, but in view of the evidence for a significant mesophyll resistance to photosynthesis in both stressed and unstressed plants it is not considered that this is due to total stomatal control. At -0.4 bar soil water potential (4 soil) the rates of transpiration and photosynthesis became independent of the atmosphere conditions and were very similar under all treatments. This was attributed to slow movement of H2O into the root zone from the surrounding soil with associated stomatal closure limiting the rates of water uptake and transpiration. With decreasing 4 soil, relative water content of the leaf (RWC) fell more rapidly and to lower levels under 27.5C/12 mbar conditions than under the other treatments. The least reduction in RWC was under the greatest relative effect on rates of gaseous exchange under 27.5C/12 mbar conditions and least under 22.5C/5 mbar conditions.--Copyright 1974, Biological Abstracts, Inc.
W76-11362

TRANSPIRATION AND PHOTOSYNTHESIS IN SOYBEAN: EFFECTS OF TEMPERATURE AND VAPOUR PRESSURE DEFICIT,
Department of Scientific and Industrial Research, Palmerston North (New Zealand) Plant Physiology Div.
M. F. Beardsell, K. J. Mitchell, and R. G. Thomas.
J Exp Bot. 24(80), p 587-595, 1973.

Descriptors: *Transpiration, *Photosynthesis, *Soybeans, Temperature, Vapor pressure.
Identifiers: Glycine-max, Mesophyll resistance.

Continuous and simultaneous measurements of CO2 exchange and transpiration rates of whole soybean plants were made under contrasting, controlled evironmental conditions for periods of up to 3 days. Daytime temperatures and vapor pressure deficits (VPD) were 27.5C/12 mb; 27.5C/mb; 22.5C/12 mb, 22.5C/ mb. Night temperatures were 5c lower than day temperatures and night VPD was 2.7 mb and 3.5 mb at the higher and lower temperature respectively. The experimental conditions were virtually the same as those under which the plants had been grown. Transpiration rates were higher at the higher VPD but were also influenced by temperature. At 12 mb VPD the rates were 16 per cent lower at 22.5C than at 27.5C. Temperature had no effect on the transpiration rate at 5 mb VPD. Photosynthesis rates were lower at 5 mb VPD than at 12 mb VPD at both temperatures: the difference was substantially greater (c. 70%) at 22.5C. Under all treatments mesophyll resistance (r'm) appeared to have a major effect on the photosynthetic rate, and varied more than twofold between treatments. r'm was highest in plants grown at 22.5C/5 mb VPD and lowest at 27.5C/12 mb VPD.--Copyright 1974, Biological Abstracts, Inc.
W76-11407

ROTATABLE SPRINKLER AND WATER DEFLECTOR USED THEREWITH,
Johns-Manville Corp., Denver, Colo. (Assignee).
P. N. Cassimatis, and J. R. McComas.
U. S. Patent No. 3,955,762, 7 p, 10 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 946, No 2, p 616, May 11, 1976.

Descriptors: *Patents, *Irrigation, *Sprinkler irrigation, *Irrigation practices, *Irrigation efficiency, Water distribution(Applied), Application equipment, Nozzles, Deflection.

A rotatable impact sprinkler is described which includes a nozzle through which a jet of water issues. An oscillating arm has an end movable in front of and to one side of the nozzle. The sprinkler also includes a water deflector which is connected with this end of the oscillating arm and which is movable into and out of the water jet. The deflector includes three water deflecting surfaces which receive and redirect water from the jet in a smooth, substantially turbulent free manner. This water is first redirected along a first straight path at least approximately 90 degrees from the axis of the jet. It is then redirected along a second path at an acute angle with and in front of the first path and thereafter it is redirected along a third path which is approximately parallel with the axis of the issuing jet. (Sinha - OEIS)
W76-11445

SPRINKLER ADJUSTMENT,
Telsco Industries, Garland, Tex. (Assignee).
C. W. Phaup.
U. S. Patent No. 3,955, 764, 4 p, 5 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 946, No 2, p 617, May 11, 1976.

Descriptors: *Patents, *Irrigation, *Sprinkler irrigation, *Irrigation practices, *Irrigation efficiency, Water distribution(Applied), Application equipment, Nozzles.
Identifiers: Pop-up sprinklers.

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An adjustable nozzle for rotary pop-up sprinklers allows an operator to accurately position the arc of coverage to any desired location while the pop-up sprinkler is in operation without rotating the entire sprinkler relative to the riser on which it is threaded. The invention eliminates the need for special adjusting tools, and hides the fact that the nozzle can be adjusted from the intermeddler who tampers with easily accessible controls. (Sinha-OEIS)
W76-11446

EFFECTS OF IRRIGATION: MULCH AND N-FERTILIZERS ON YIELD COMPONENTS OF ARABICA COFFEE IN KENYA,
Edinburgh Univ. (Scotland). Inst. of Tree Biology.
M. G. R. Cannell.
Exp Agric. 9(3); p 225-232, 1973

Descriptors: *Irrigation effects, Africa, *Mulching, Fertilizers, *Crop production, *Nitrogen, Fruit crops.
Identifiers: *Kenya, Mulch, *Coffee(Arabica).

Irrigation, mulch and N-fertilizers increased the yield of fresh fruit/tree by 66% due to increases of 42% in the number of fruiting nodes/tree, 14% in number of fruits/node and 15% in fresh weight/fruit; these 3 yield components accounted for 42, 13 and 6% of the variation in yield among all treatments combinations, Bean/fruit weight ratios and times of flowering were not affected. Correlations between yield components were positive, suggesting that still more nodes could be produced per tree and per unit area before physiological limits to yield were reached.--Copyright 1973, Biological Abstracts, Inc.
W76-11456

CORN PLANT WATER STRESS AS INFLUENCED BY CHISELING, IRRIGATION, AND WATER TABLE DEPTH,
Agricultural Research Service, Florence, S.C. Coastal Plains Soil and Water Conservation Research Center.
D. C. Reicosky, R. B. Campbell, and C. W. Doty.
Agronomy Journal, Vol. 68, No. 3, p 499-503, May-June 1976. 5 fig, 3 tab, 7 ref.

Descriptors: *Corn(Field), *Water table, *Soil-water-plant relationships, *Crop production, Soil management, Crop response, *Irrigation effects, Stomata, Cultivation, Moisture stress, *Chiselling.

Chiseling and irrigation effects on plant water status were evaluated through leaf water potential, stem diameter and stomatal resistance measurements. Corn (Zeas mays L.) grown on a Varina sandy loam chiseled to 38 cm was compared with that grown on conventionally tilled plots. Chiseling had no effect on daily minimum leaf water potential the first year (1972) and only a slight effect on stomatal resistance, but irrigating had some beneficial effect. At tasseling in 1973, with a water table 80 cm from the surface, chiseling produced deeper-rooted corn that allowed water utilization in the capillary fringe above the water table; leaf water potential increased slightly while stomatal resistance and stem diameter fluctuation decreased. Plant-water status on chiseled plots was similar to that on furrow-irrigated plots. Improved midday plant water status caused a 8-metric ton/ha increase in corn ear yields. Results indicate that chiseling of soils with root restricting layers can increase corn production, especially when the water table is about 80 cm from the surface tasseling. (Jahns-Arizona)
W76-11503

SOIL WATER UPTAKE BY ALFALFA,
Agricultural Research Service, Kimberly, Idaho, Snake River Conservation Research Center.
R. A. Kohl, and J. J. Kolar.
Agronomy Journal, Vol. 68, No. 3, p 536-538, May-June 1976. 4 fig, 14 ref.

Descriptors: *Soil water movement, Soil water, *Moisture uptake, *Alfalfa, *Soil water plant relationships, Root zone, Xylem, Soil profiles, Moisture stress.

Soil water uptake by alfalfa (Medicago sativa L.) was studied by monitoring a seed crop with a neutron moisture probe. Plant water potential measurements support passive uptake. Water was withdrawn in the lower root zone, where soil matric potentials were between -7 and -10 bars, while the upper portion of the profile was above -2 bars. Results indicate that passive water uptake requires large water potential differences between the root xylem and soil in the moist upper portion of the profile. Alfalfa plant moisture potentials decreased through the growing season, possibly due to moisture stress and maturity. While water is preferentially taken up from layers where the soil water potential is high, it continues being withdrawn from layers of lower potential. Root location (shallow or deep) does not appear to influence water uptake. (Jahns-Arizona)
W76-11504

DROUGHT RESISTANCE CHARACTERISTICS OF BLUE GRAMA SEEDLINGS,
Agricultural Research Service, Fort Collins, Colo.
For primary bibliographic entry see Field 2I.
W76-11505

NITROGEN-SILICON INTERACTION IN PLANTS GROWN IN DESERT SOIL WITH NITROGEN DEFICIENCY,
California Univ., Los Angeles. Lab. of Nuclear Medicine and Radiation Biology.
A. Wallace, E. M. Romney, and R. T. Mueller.
Agronomy Journal, Vol. 68, No. 3, p 529-30, May-June 1976. 5 tab, 7 ref.

Descriptors: *Nitrogen, *Plant growth, *Fertilizers, *Range grasses, *Barley, Fertility, Arid lands, Beans, Calcareous soils, Soil dynamics, Deficient elements, Cations, Anions, Soil moisture, Sierozems.
Identifiers: *Silicon, Ion competition.

Comparisons were made for the yield and nutrient status of native range grass (Hilaria rigida), barley (Hordeum vulgare L. 'Atlas 57') and bush beans (Phaseolus vulgaris) grown in a glasshouse in soils from shrub and bare desert areas. The latter two plants were grown with and without added N fertilizer. The relationship of N to other anions was studied to determine the nutrient relationships in desert soil infertility even with N supplied. Plants grown in the infertile soil had greatly decreased yields and slightly lower total cation concentrations, were low in N and usually had greater Si concentrations. Nitrogen fertilizer caused only a slight yield improvement in infertile soils but increased N and reduced Si in the plants. Barley yields were much greater on shrub-area soils than bare-area ones, and added N fertilizer did little to overcome the suppressed yield from the latter soil. Similar results were obtained with bush bean. The Si appeared to enter the plant's cation-anion balance. (Jahns-Arizona)
W76-11509

MANAGEMENT OF WATER RESOURCES UNDER DIFFERENT SOCIO-ECONOMIC CONDITIONS,
Arizona University, Tucson, Committee on Arid Lands Resources.
For primary bibliographic entry see Field 6B.
W76-11514

EFFECTS OF IRRIGATION REGIMES, PLANTING DATES, NITROGEN LEVELS, AND ROW SPACING ON SAFFLOWER CULTIVARS,
Agricultural Research Service, Phoenix, Ariz.
G. H. Abel.
Agronomy Journal, Vol. 68, No. 3, p 448-451, May-June 1976. 8 tab, 7 ref.

Descriptors: *Irrigation effects, *Planting management, *Nitrogen, *Fertilization, *Crop response, Irrigation efficiency, Crop production, Arid lands, Arizona, Water management(Applied), Water conservation.
Identifiers: *Safflower.

In three experiments on safflower (Carthamus tinctarius L.) cultivars over a 3 year period seed yields were greater in the last two years with crops planted on December 15 than those planted February 15. Plants in two-row plots produced fewer seeds/head and smaller seeds than those in one-row plots, but increased populations in the former group compensated for such deficiencies and the yields were comparable. An irrigation regime involving early cut off conserved water and labor, reduced weed growth and produced optimum seed yields at lower levels of nitrogen fertilization. The best fertilization levels were from 84 to 336 kg/ha, according to the planting date, irrigation regime and cultivar. For the Laveen clay loam soil at the test site (Mesa, Arizona), 168 kg/ha was optimum for a December planting; quantities exceeding 84 kg/ha had no yield advantage with a February planting. The 'Dart' cultivar outyielded all others used, especially when given the optimum fertilization and irrigation treatment. (Jahns-Arizona)
W76-11515

FERTILIZING DRYLAND GRAIN SORGHUM ON UPLAND SOILS THE 20- TO 26- INCH RAINFALL AREA IN KANSAS,
Kansas State Univ., Hays. Fort Hays Branch Experiment Station
C. A. Thompson.
Kansas Bulletin No. 579, Kansas Agricultural Experiment Station Kansas State Univ., Manhattan, 1975. 20 p. 6 fig, 11 tab.

Descriptors: *Fertilization, *Crop response, *Grain sorghum, *Dry farming, *Kansas, Nitrogen, Soil moisture, Stubble mulching, Phosphorus, Soil-water-plant relationships, Water utilization.

The results are presented of 227 dryland grain sorghum fertility experiments conducted on upland sites in Kansas from 1964 to 1972. The study area was characterized by average yearly rainfall of 20 to 26 inches and had been unirrigated. Nitrogen had the greatest positive effect on grain yields, with 72% of the sites responding. The dryland sorghum did not respond satisfactorily to potassium, sulfur, zinc, iron, manganese or copper; however, extremely eroded soils or newly established terrace channels may respond to zinc. Response to N improved as the soil moisture increased (up to 92% with more than 54 inches of moist soil). Plots fertilized with N produced yields of up to 10 bu/a more than unfertilized plots as soil moisture increased. Yield increases were small when the quantity of moist soil was less than 6 inches. Stored moisture may be improved by stubble mulch farming, minimum tillage, till-plant systems and combinations of chemical tillage. Water-use efficiency is also enhanced by increased soil moisture (2.33 bu/in water at low soil moisture to 3.35 bu/in water at higher levels). Efficient N use and expected yield rates are discussed along with soil phosphorus effects. (Jahns-Arizona)
W76-11516

NITROGEN FLUX INTO CORN ROOTS AS INFLUENCED BY SHOOT REQUIREMENT,
Agricultural Research Service, Byron, Ga.
J. H. Edwards, and S. A. Barber.
Agronomy Journal, Vol. 68, No. 3, p 471-4, May-June 1976. 3 tab, 8 ref.

Descriptors: *Nitrogen, *Fertilization, *Nutrient requirements, *Corn(Field), *Root systems, Plowing management, Plant growth, Absorption.
Identifiers: Root-trimming, Root splitting.

xperiments were conducted to determine the in-
uence of shoot N requirement on N influx/m of
orn roots. Trimmed- and split-root procedures
ere used for solution culture experiments in the
owth chamber to vary the N absorbing roots/unit
shoot and assess the impact on N influx. Roots
immed 2 days before influx measurement had
ight increases in the N influx/m of root, causing
duced N uptake/plant. Roots split between N-
ntaining and N-free solutions from seedling
age until influx measurement at 16 or 18 days had
eater increases in net N influx than trimmed
ots had. Both experiments revealed no relation
tween N level within the root and N uptake
te/m of root. Increased shoot demand for N does
t immediately affect N influx into the root, but
stress causes an increased influx capability.
ants developing throughout their growth cycle
th N restricted to part of the root system may
sorb N more rapidly through those localized
ots exposed to N than when N is placed into the
calized portion of soil after several weeks'
owth. (Jahns-Arizona)
76-11519

**RYLAND CROPPING SEQUENCES WITHIN A
LL WHEATGRASS BARRIER SYSTEM,**
ricultural Research Service, Sidney, Mont.
L. Black, and F. H. Siddoway.
rnal of Soil and Water Conservation, Vol. 31,
. 3, p 101-105, May-June 1976. 4 tab, 1 fig, 9 ref.

scriptors: *Dry farming, *Farm management,
heat grasses, *Erosion control, Wind erosion,
il water, Excess water, Recharge, Crop produc-
n, Fallowing, Water utilization, Encroachment,
ter yield.
ntifiers: *Intensive cropping.

all wheatgrass (Agropyron elongatum 'Alkar')
rier system designed to control wind erosion
to collect and hold snow overwinter was stu-
d for 8 years to determine if increased soil
ter recharge can support more intensive
pping than crop-fallow rotations. This system
uces the fallow acreage and thereby the risk of
tinued salinization problems. Compared with
rotected land, barriers almost doubled over-
ter soil water storage the first 9 months. With
ogen and phosphorus fertilization, average an-
l grain yields were 30 to 69% greater for inten-
cropping systems than for conventional spring
at-fallow. The continuous cropping system
d 71 to 80% of the average precipitation
ween harvests, while conventional spring
at-fallow used only 30%. Production efficien-
er inch of water used was three times greater
annual cropping systems, consisting mainly of
ter wheat and safflower, than for spring wheat-
w; total grain production per acre unit of
cipitation received can also be increased.
sed water between crops, which was much
ter for spring wheat-fallow, may contribute to
e seeps. (Jahns-Arizona)
5-11521

**DIES ON THE IMPROVEMENT EFFECT
WASTE LIQUOR FROM PULP MILLS FOR
SOILS: I. THE VEGETATION EXPERI-
NTS WITH SOYBEANS AND CORN, (IN
ANESE),**
ane Univ., Matsue (Japan). Faculty of
culture.
primary bibliographic entry see Field 5E.
-11563

**ES ON SOYBEANS: MOISTURE AND TEM-
ATURE RELATIONS,**
ell Univ., Ithaca, N. Y. Dept. of Entomology
Limnology.
. Simpson, and W. A. Connell.
ron Entomol. 2(3), p 319-323, 1973.

riptors: *Mites, *Soybeans, Rainfall,
sture, *Temperature, Correlation analysis,
atology.

Identifiers: Tetranychus-Turkestani.

Computer analysis of population data for mites, predominantly Tetranychus turkestani Ugarov and Nikolski, in 8 soybean fields during a 7-yr period showed a significant correlation with both rainfall and maximum temperature. Rainfall accounted for 51.3% and average maximum temperature for 25.3% of the population variation. Climatological conditions during Aug. appeared most important. Correlation of rainfall totals with mite population for each of the mo. June through Sept. indicated that Aug. rainfall was most influential. Moreover, of the monthly average maximum temperatures only those of Aug. were significantly related to peaks of mite abundance. Measurement of soybean leaf temperatures for 2 wk with electrical monitoring equipment showed that T. turkestani lives under temperature conditions that can fluctuate widely within short periods.--Copyright 1973, Biological Abstracts, Inc.
W76-11604

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

COLLECTED REPRINTS, VOLUME III: 1971-1974,
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 6B.
W76-11103

HYDROLOGIC ASPECTS OF FLOOD MANAGEMENT IN THE CHEMUNG RIVER BASIN,
Cornell Univ., Ithaca, N. Y. School of Civil and Environmental Engineering.
For primary bibliographic entry see Field 2E.
W76-11106

VEGETATION MAPPING IN LAKE CHAMPLAIN WETLANDS,
Vermont Univ., Burlington. Dept. of Geography.
A. O. Lind, and W. G. Howland.
Available from the National Technical Information Service Springfield, Va as PB-256 207, $4.00 in paper copy, $3.00 in microfiche. Vermont Water Resources Research Center, Burlington, July 1975. 28 p, 5 fig, 3 tab, 9 ref. OWRT A-022-Vt(1).

Descriptors: *Mapping, Remote sensing, *Vegetation, *Wetlands, Lakes, *Vermont, *Aerial photography, Canopy, *Classification, Methodology, Deltas, Rivers.
Identifiers: *Lake Champlain(Vt), Missiquoi River delta(Vt), Lamoille River delta(Vt).

Detailed canopy vegetation maps at a scale of 1:20,000 have been produced for two major wetlands in the Missisquoi and Lamoille River Deltas of the Lake Champlain Basin, based on the interpretation of medium-high altitude color aerial photography. Photo interpretation was visual through use of a Bausch and Lomb Zoom 240 stereoscope. Signatures were established for a classification of thirteen canopy types. Species composition, relative dominance, canopy height and other characteristics of canopy associations are discussed. Ground control was achieved in summer of 1975 through a rigorous program of field survey. Methodology is carefully outlined for future studies of a comparative nature.
W76-11111

LAND PRICES IN FLOOD HAZARD AREAS: APPLYING METHODS OF LAND VALUE ANALYSIS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6F.
W76-11112

INTERACTIONS BETWEEN LAND USE AND URBAN WATER RESOURCES PLANNING,
Purdue Univ., Lafayette, Ind. School of Civil Engineering.
J. W. Delleur, W. L. Miller, and H. R. Potter.
Water Resources Bulletin, Vol. 12, No. 4, p 759-777, August, 1976. 4 tab, 31 ref.

Descriptors: *Water resources, *Planning, *Land use, *Control, Population, Growth rate, Prices, Income, Urbanization, Mathematical models, Simulation analysis, Assessment, Alternative planning, Recreation, Aesthetics, Economics, Research priorities.
Identifiers: Consumer behavior, Preferences.

The patterns of land use and their relationship to urban water resources are examined from the point of view of population growth, consumer behavior, and preferences of price, income, and land use controls. The changes that need to be made in present social attitudes or water resources laws to satisfy the desired new developments are examined. Several implementation methods that are feasible and effective for changing urban development patterns are considered as well as models for assessing alternate development plans. The needs for research are outlined. It is concluded that very few projects look at the global interactions of patterns of urban development and urban water resources. The need is for a generalized systems analysis which integrates the urban planning process while promoting environmental quality and includes the feedback of the environmental impacts on the planning activities. (Bell-Cornell)
W76-11130

LOCAL ATTITUDES AND WATER RESOURCES DEVELOPMENT: A CANADIAN CASE STUDY,
Prince Edward Island, Charlottetown. Dept. of Sociology and Anthropology.
For primary bibliographic entry see Field 6B.
W76-11132

OPTIMIZATION OF WATER DISTRIBUTION NETWORK SYSTEMS,
Weston (Roy F.), Inc., West Chester, Pa.
For primary bibliographic entry see Field 8B.
W76-11133

ESTIMATING FLOW CONDITIONS FOR RIVER MODELS,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 5B.
W76-11136

MULTI-CRITERION RANKING OF ALTERNATIVE LONG-RANGE WATER RESOURCE SYSTEMS,
National Water Authority, Budapest, Hungary. Dept. of Water Management Policy.
For primary bibliographic entry see Field 6B.
W76-11139

ESTIMATED COSTS OF MECHANICAL CONTROL OF WATER HYACINTHS,
Georgia Univ., Athens. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 5G.
W76-11141

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A STOCHASTIC PROGRAMMING MODEL APPLIED TO WATER RESOURCES MANAGEMENT,
Computing Center for Universities, Budapest (Hungary).
J. Pinter.
ESZK II, (Egyetemi Szamitokozpont), Computing Center for Universities, Budapest, Hungary, 65 p, August 1975. 2 fig, 7 tab, 37 ref.

Descriptors: Water resources, *Management, *Stochastic processes, *Mathematical models, *Planning, *Reservoirs, *Low-flow augmentation, Optimization, Water quality, Design, Evaluation, Computers, Equations, Systems analysis, Economics.
Identifiers: *Hungary, *Cost minimization, Random search procedure, Flow-rate equalization, Water quantity.

Hungary has a rather changeable water supply situation, suffering periodically from the danger of inundation and the occurrence of water shortage; this has led to the conception of constructing storage reservoirs. Beside the agricultural needs, there exists a strong tendency toward the grow of industrial demands. This paper considers the problem of water resources management in an industrialized area of Hungary, the Sajo-region. A mathematical model is presented for planning a system of reservoirs for the purpose of low-flow augmentation. The computational solution to this problem is detailed, in connection with which a random search optimization procedure is presented. Finally, a possible comprehensive model of water resources management is designed, considering both quality and quantity aspects. (Bell-Cornell)
W76-11144

INTEGRATED CONTROL OF ALLIGATOR WEED AND WATER HYACINTH IN TEXAS.
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 5G.
W76-11145

AQUATIC PLANT CONTROL PROGRAM FOR ALLIGATOR WEED AND WATER HYACINTH IN TEXAS,
Texas Parks and Wildlife Dept. Houston.
For primary bibliographic entry see Field 5G.
W76-11147

NEW TECHNIQUES IN VEGETATION MAINTENANCE ON MILITARY RESERVATIONS,
Stull Chemical Co., San Antonio, Tex.
For primary bibliographic entry see Field 5G.
W76-11149

HERBICIDES AS ANTIPOLLUTANTS,
Agricultural Research Service, Laramie, Wyo. Crops Research Div.
For primary bibliographic entry see Field 5G.
W76-11150

AQUATIC PLANT CONTROL PROBLEMS AT SAM RAYBURN RESERVOIR,
Army Engineer District, Fort Worth, Tex.
For primary bibliographic entry see Field 5G.
W76-11152

MULTIPLE OBJECTIVE PLANNING FOR WATER RESOURCES, (VOL I),
Idaho Research Foundation, Inc. Moscow.
For primary bibliographic entry see Field 6B.
W76-11173

MULTIPLE OBJECTIVE PLANNING FOR WATER RESOURCES, (VOLUME II),
Idaho Research Foundation, Inc., Moscow.
For primary bibliographic entry see Field 6B.
W76-11174

PRELIMINARY INVESTIGATIONS OF A HEADWATER CREEK IN EASTERN KENTUCKY,
Virginia Commonwealth Univ., Richmond. Dept of Biology
For primary bibliographic entry see Field 5G.
W76-11284

WATER QUALITY MODEL OF THE LOWER FOX RIVER, WISCONSIN,
Environmental Protection Agency, Anchorage, Alaska. Alaska Operations Office
For primary bibliographic entry see Field 5B
W76-11316

EVALUATION OF PRIOR APPROPRIATION IN MISSISSIPPI,
Mississippi State Univ., Mississippi State. Water Resource Research Inst.
For primary bibliographic entry see Field 6E.
W76-11336

AN EVALUATION OF PUBLIC HEARINGS ON WATER DEVELOPMENT PROJECTS IN MISSISSIPPI,
Mississippi State Univ., Mississippi State. Social Science Research Center.
For primary bibliographic entry see Field 6B.
W76-11337

ESTABLISHING INSTREAM FLOWS: ANALYSIS OF THE POLICY-MAKING PROCESS IN THE PACIFIC NORTHWEST,
Washington State Univ., Pullman. Dept. of Political Science.
For primary bibliographic entry see Field 6B.
W76-11339

FLOOD PLAIN INFORMATION: KASKASKIA RIVER, BEAR CREEK, LAKE FORK CREEK, WEST FORK CREEK AND 'A' CREEK, DOUGLAS COUNTY, ILLINOIS, NO. 1.
Army Engineer District, St. Louis, Mo.
Prepared by Homer L. Chastain and Associates, Decatur, Illinois, for the County of Douglas, Illinois, February 1974. 36 p, 10 fig, 20 plates, 4 tab.

Descriptors: *Floods, *Flood stages, *Flow characteristics, *Flood plains, *Flood profiles, Flood flow, Flood data, Peak discharge, Channels, Channel improvement, Runoff, *Illinois.
Identifiers: *Kaskaskia River(IL), Bear Creek(IL), Lake Fork Creek(IL), West Fork Creek(IL), 'A' Creek(IL), Douglas County(IL), Chesterville(IL), Standard Project Flood, Intermediate Regional Flood, Flood plain management program.

Kaskaskia River, a tributary of the Mississippi River, flows through rolling, cultivated farmland in this study reach for 8.7 miles from its confluence with Lake Fork Creek to the Douglas - Coles County line. It falls .8 feet per mile. Its tributaries, Bear Creek, Lake Fork Creek, West Fork Creek, and 'A' Creek vary in slope from 1.9 to 3.5 feet per mile. Bear Creek and West Fork Creek consist partly of man-made improved channels, while the other two creeks are more meandering. Except for a small commercial development in Chesterville (IL), the flood plains, which vary from 1700 to 10,000 feet wide on the river and 400 to 7,000 feet on the creeks, are predominantly woods or farm lands. Floods occur during all seasons, particularly in the spring resulting from thunderstorms coupled with preceding periods of prolonged rainfall. Water stages rise quickly, usually within 8 hours, to flood levels. Natural obstructions and many of the 25 bridges over the river obstruct flood flows. The only flood damage reduction measures have been channel improvements on Bear, West Fork and 'A' Creeks. The highest recorded flood occurred in May 1943 when Lake Fork was reported as being the highest in 30 years and crops were washed out. Estimated peak discharges for an Intermediate Regional Flood and Standard Project Flood are 18,970 cubic feet per second and 23,530 cfs respectively at Douglas - Coles County line, and would inundate much of the flood plain. Channel velocities in the Kaskaskia River would vary between 1 and 6 ft/sec in an IRF, and would be slightly higher in an SPF. (Salzman-North Carolina)
W76-11341

FLOOD PLAIN INFORMATION: LAKE MONROE, NEAR SANFORD, FLORIDA.
Army Engineer District, Jacksonville, Fla.
Prepared for the City of Sanford and the Board of County Commissioners of Seminole County, July 1971. 25 p, 4 fig, 10 plates, 2 tab.

Descriptors: *Flood plains, *Floods, *Flow duration, *Flood profiles, Dams, Channel improvement, Storms, Flood data, Historic floods, Flood frequency, Erosion, Flood peak, Non-structural alternatives, Zoning, Flow characteristics, *Florida.
Identifiers: *Lake Monroe(FL), Sanford(FL), Seminole County(FL), St Johns River(FL), Intermediate Regional Flood, Standard Project Flood.

Lake Monroe is one of the larger lake components of the St. Johns River. The lake is 6 miles long, 4 miles wide and usually about 7 feet deep. This report is concerned with about 6 miles of the south shore. Sanford occupies a 2 mile reach of this shore which has flood plains extending 300 to 3,500 feet inland. The watershed above Sanford is 2,400 square miles of flat, poorly drained land. In the flood plain within Sanford are motels, commercial and government buildings, residences, utilities, and streets. Flooding occurs in late summer and early fall as the result of above normal rainfall. Local thunderstorms, over a period of several days and/or tropical storms can contribute to this rainfall. Damage from floods will occur when stages exceed 7 feet above mean sea level. Floods of this magnitude have occurred 9 times since 1920, the largest occuring in 1953 when flood stage reached 8.5 ft msl. Losses were $250,000. The Intermediate Regional Flood and the Standard Project Flood would reach 9.3 and 10.5 ft msl respectively. Large floods would rise at a rate of about 3 inches per day, and remain at or near peak stage for as much as 10 days to a month or more. Small reductions in flood stages and duration of flooding on Lake Monroe will occur when construction of the upper St. Johns River Project of the Central and South Florida Flood Control Project is completed. A concrete retaining wall built along part of the shoreline of the lake provides protection against erosion caused by wave action but not against flooding since the top of the wall is below 7 ft. Local building and zoning regulations are used to regulate construction in flood prone areas. (Henley-North Carolina)
W76-11342

FLOOD PLAIN INFORMATION: NORTHEAST VOLUSIA COUNTY, FLORIDA.
Army Engineer District, Jacksonville, Fla.
Prepared for the Board of County Commissioners of Volusia County, July 1971. 27 p, 10 fig, 3 plates, 3 tab.

Descriptors: *Storms, *Floods, *Tides, *Flood profiles, *Flood plains, *Hurricanes, Control structures, Flood stages, Flood duration, Erosion, Flood peak, Estuaries, Shores, Historic floods, Flood recurrence interval, Flood data, Flood frequency, *Florida.
Identifiers: Volusia County(FL), Daytona Beach(FL), Ormond Beach(FL), Holly Hill(FL), South Daytona(FL), Port Orange(FL), Halifax River(FL), Tomoka River(FL), Spruce Creek(FL), Hurricane parameters, Runup, S

dard Project Tidal Flood, Intermediate Regional Tidal Flood.

This report covers an urbanized area of about 130 square miles with a population of 80,000. It includes the cities of Daytona Beach, Ormond Beach, Holly Hill, South Daytona, and Port Orange. The Halifax River and its tributaries, Tomoka River and Spruce Creek, drain the area. Many small bridges and culverts, as well as insufficient capacities of drainage systems, can adversely affect flood plains. Flooding occurs after intense rainfall and high tides from occassional hurricanes. A hurricane has passed within 50 miles of Daytona Beach once every 9 years since 1900 and high tides have damaged urban development 3 times during that period. During a 1950 tropical storm 8 foot elevations were reached on the Halifax River. During an Intermediate Regional Tidal Flood, waters would reach 7 to 8.5 feet in the Halifax River and combined tide and runup could reach 16 feet along the ocean front. Standard Project Tidal Floods would reach 8 to 10 feet on the Halifax River and 20 feet along the ocean front. Maximum elevations would normally be reached 4 to 6 hours after the onset of hurricane winds and would affect 8,000 acres of urban land. Low bulkheading along the Halifax River and a fairly extensive canal system serve as some protection against floods. (Henley-North Carolina)
W76-11343

FLOOD PLAIN INFORMATION: SWIFT CREEK, MACON AND BIBB COUNTY, GEORGIA.
Army Engineer District, Savannah, Ga.
Prepared for the City of Macon and Bibb County, Georgia, June 1973. 30 p, 11 fig, 13 plates, 6 tab.

Descriptors: *Floods, *Flood plains, *Flood profiles, *Flood forecasting, *Flood stages, Flow duration, Flood flow, Storms, Hurricanes, Historic floods, Flood peak, Flow characteristics, Flood plain zoning, Warning systems, Obstructions to flow, *Georgia.
Identifiers: Macon(GA), Bibb County(GA), Swift Creek(GA), *Flood plain management, Ocmulgee River(GA), Jones County(GA), Intermediate Regional Flood, Standard Project Flood.

The study area encompasses about 11 square miles of Swift Creek watershed which lies in eastern Bibb and southern Jones Counties. Located near the City of Macon, Swift Creek is a tributary of Ocmulgee River and has narrow flood plains which are experiencing rapid commercial and industrial development along the highways and two railroads in the study area. Residential development is also occurring on the flood plain. Obstructions to flood flows include dams, some of the 9 bridges over Swift Creek, buildings, and vegetation. The City of Macon and Bibb County enacted flood plain zoning ordinances and are served by a flood warning system maintained by the National Weather Service and the local Civil Defense Office. Flooding can occur in any season and can result from general rainstorms, thunderstorms and hurricanes. Five large floods have occurred since 1916, the largest occurring in 1948 when a peak discharge of 83,500 cubic feet per second was reached on Ocmulgee River. The Intermediate Regional Flood and Standard Project Flood would have a peak discharge of 4,740 and 11,850 cfs, respectively, on Swift Creek. The IRF would typically rise 15 feet in 6 hours and remain above bankfull for 12 hours. Channel velocities could reach 10 ft/sec. Nine houses, 2 business establishments, roads, and utilities are within the 460 acres which would be flooded during an IRF. During the SPF 540 acres would be flooded. (Henley-North Carolina)
W76-11344

FLOOD PLAIN INFORMATION: WAYCROSS DRAINAGE CANAL, WAYCROSS AND WARE COUNTY, GEORGIA.
Army Engineer District, Savannah, Ga.
Prepared for Waycross and Ware County, Georgia, June 1969. 56 p, 36 fig, 22 plates, 17 tab.

Descriptors: *Canals, Floods, *Flood plains, Channels, *Flood profiles, Flow characteristics, *Flood forecasting, *Flood peak, Warning systems, Channel improvement, Flood stages, Historic floods, Storms, Hurricanes, Obstructions to flow, *Georgia.
Identifiers: *Waycross Drainage Canal(GA), Waycross(GA), Ware County(GA), Satilla River(GA), Intermediate Regional Flood, Standard Project Flood.

A tributary of the Satilla River, the Waycross Drainage Canal (with drainage area of 14.5 square miles) drains most of the city of Waycross in Ware County. Information on a 4.2 mile reach of Waycross Drainage Canal and on four tributaries which have a combined reach length of 3.2 miles is presented. Waycross Drainage Canal has a well defined channel and is surrounded by flat terrain. When flows exceed channel capacity, considerable development is subject to flooding. The entire flood plain is extensively developed with residential buildings, businesses, industry and commercial buildings. Vegetation and 33 bridges would obstruct flood flows of the Intermediate Regional Flood. The IRF would flood 450 buildings and 400 acres. Peak discharge would reach 1,510 cubic feet per second at the gage at City Boulevard with channel and overbank velocitie of 8 and 4 feet per second in the canal. IRF can be expected to rise 8 feet in 12 hours and remain above bankfull for 16 hours. The Standard Project Flood would flood 930 buildings and 810 acres. Peak discharge would reach 8,420 cfs with channel and overbank velocities of 10 and 5 feet per second respectively. SPF can be expected to rise 18 feet in 14 hours and remain above bankfull for 20 hours. The area is subject to general rainfloods and floods resulting from hurricanes. Building permits are required for all new construction, but Waycross and Ware County need flood plain regulations. (Henley-North Carolina)
W76-11345

FLOOD PLAIN INFORMATION: BUCK CREEK AND GRASSY CREEK, MARION COUNTY, INDIANA,
Army Engineer District, Louiville, Ky.
Prepared for Marion County Metropolitan Planning Department and Indianapolis Flood Control District, June 1973. 31 p, 14 fig, 11 plates, 7 tab.

Descriptors: Floods, *Historic floods, *Flood data, Flood stages, Flow characteristics, *Flood plains, *Flood protection, *Non-structural alternatives, Planning, Peak discharge, Flow duration, Flood plain zoning, Flash floods, *Indiana.
Identifiers: Buck Creek(IN), Grassy Creek(IN), Marion County(IN), Intermediate Regional Flood, Standard Project Flood, Cumberland(IN), Acton(IN), Subdivision regulations, Indianapolis(IN)

The study reach of this report includes 101 sq mi drained by Buck Creek on the east side of Indianapolis (IN) and 18.79 sq mi drained by Grassy Creek on the west side of Buck Creek. Both streams flow in a southerly direction with an average slope of 5.25 ft/mi. Their flood plains consist primarily of cropland and undeveloped land although development pressures are increasing. The 1970 population of Warren was 86,000 and is expected to reach 110,000 by 1980. Main flood season occurs January through April resulting from heavy rains; however, intense local storms can cause flash flooding. Channel velocities can range up to 15 ft/sec. Floods are generally short, lasting no longer than 48 hours. No flood control projects exist. Some channel improvement has been undertaken. A county-wide flood plain zoning ordinance regulates all construction in flood plains. Presently 24 bridges and natural vegetation obstruct the flood flow. Compared to the greatest known flood which occurred in May 1956 discharging 16,800 cubic feet per second on Buck Creek and 5,100 cfs on Grassy Creek, an Intermediate Regional Flood and a Standard Project Flood would have peak discharges of 21,000 cfs and 32,000 cfs respectively on Buck Creek. In an IRF a peak discharge of 5,800 cfs is predicted on Grassy Creek. (Salzman - North Carolina)
W76-11346

FLOOD PLAIN INFORMATION: KENAI RIVER, PHASE II, KENAI PENINSULA BOROUGH, ALASKA,
Army Engineer District, Anchorage, Alaska.
Prepared for the Kenai Peninsula Borough, Alaska, June 1975. 25 p, 12 fig, 18 plates, 3 tab.

Descriptors: Floods, *Flood flow, *Flood forecasting, *Flood profiles, Flood stages, *Ice jams, *Alaska, *Flood plains, Storms, Historic floods, Flood data, Flood frequency, Peak discharge, Stream erosion, Glaciation, Warning systems, Obstructions to flow, Runoff.
Identifiers: Kenai Peninsula Borough(AK), *Kenai River(AK), Jokulhlaup, Killey River(AK), Moose River(AK), Standard Project Flood, Intermediate Regional Flood.

'The portion of Kenai River included in this study extends from Moose River at Sterling, approximately ten miles upstream from the confluence with the Killey River, to the Moose Range boundary' and has a drainage area of 49 square miles. Most of the area is wilderness but there is ongoing residential and recreational development, and greatly increased development is expected. Obstructions to flood flows include vegetation, ice jams, docks and gravel pads extending into the river. Flooding can result from conventional storms runoff in summer and fall, the sudden release of glacier dammed waters (a phenomenon called a jokulhlaup), and spring ice jams and rapid snowmelts. Moderate damage was incurred during a flood in September, 1974, which reached a height of 184.2 feet and had a peak discharge of 26,800 cubic feet per second at Soldotna. An Intermediate Regional Flood will reach a height of 185.5 feet, have a peak discharge of 37,500 cfs at Soldotna and have channel velocities of 6.3 ft and overbank velocities of 3 ft. A Standard Project Flood will reach a height of 188.4 ft, have a peak discharge of 62,000 cfs, and have channel velocities of 7.2 ft. Flood flows cover only a small amount of overbank area with runoff from large storms modified by the regulating effects of Kenai Lake, Skilak Lake and lesser lakes and swamps in the watershed. Thus IRF and SPF discharges will create lower levels of flooding than ice jam created backwaters occuring under substantially smaller flows. Damage from IRF and SPF will effect residential and recreational development and agricultural land. There is a flood warning system in the area. (See also W74-01952) (Henley - North Carolina)
W76-11347

FLOOD PLAIN INFORMATION: FISHER CREEK, SANTA CLARA COUNTY, CALIFORNIA,
Army Engineer District, San Francisco, Calif.
Prepared for Santa Clara County Flood Control and Water District, July 1973. 18 p, 6 fig, 9 plates, 6 tab.

Descriptors: *Floods, *Flood forecasting, *Flood profiles, *Flood plains, Obstructions to flow, *California, Runoff, Overland flow, Streamflow forecasting, Historic floods, Flood data, Flood frequency, Peak discharge, Flood peak, Flow duration, Flood damage, Levees, Dikes, Reservoirs, Channel improvement.
Identifiers: *Fisher Creek(CA), Santa Clara County(CA), Coyote Creek(CA), Intermediate Regional Flood, Standard Project Flood.

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The properties in the flood plain are primarily agriculture and were inundated by the flood of 1955. Open spaces in the plain are already being subjected to pressure for development. The only industrial development is a mushroom plant. About 13.8 sq mi of an 18.3 sq mi basin contribute to basin runoff in the study area. The flat, alluvial valley through which the creek flows is poorly drained and partially depressed. The main flood season for Fisher Creek, a tributary of Coyote Creek, extends from October through April when flooding may be caused by intense rainfalls. A streamflow gage has been in operation on Fisher Creek for thirty years, with records revised in light of reservoir constructions in 1936 and 1950. During the 1955 flood 480 acres were flooded and $98,000 damage resulted. In the event of an Intermediate Regional Flood (IRF) peak flows of from 600 to 2300 cfs may be expected and in a Standard Project Flood (SPF) peak flows of up to 10,000 cfs are forecasted. The 1955 flood reached an elevation of 240.0 feet and in comparison 246.5 feet and 253.5 feet may be expected for the IRF and SPF respectively. These great floods would be expected to rise in 6.5 hours for the IRF with a flood stage duration of 13 hours and for an SPF a rise of 2.3 hours with flood stage duration of 38 hours. All of the bridges and culverts in the study area are obstructive to flow at the discharges that could be expected to accompany an IRF. Tentative plans have been made to improve flow protection of Fisher Creek. Some channel improvement and diking has already been carried out by local interests. (Smith - North Carolina)
W76-11348

FLOOD PLAIN INFORMATION: ALAMITOS CREEK, INCLUDING GUADALUPE CREEK-ARROYO CALERO AND SANTA TERESA CREEK, SANTA CLARA COUNTY, CALIFORNIA,
Army Engineer District, San Francisco, Calif.
Prepared for Santa Clara County, California, July 1973. 22 p, 12 fig, 14 plates, 7 tab.

Descriptors: Floods, *Flood flow, *Flood plains, *Flood stages, Flood protection, Flood forecasting, Flood profiles, Storms, Flood data, Flood frequency, Peak discharge, Flow characteristics, Erosion, Obstructions to flow, Reservoirs, *California.
Identifiers: Santa Clara County(CA), New Almaden(CA), *Alamitos Creek(CA), San Jose(CA), Guadalupe Creek(CA), Santa Teresa Creek(CA), Calero Creek(CA), Standard Project Flood, Intermediate Regional Flood.

Flooding along these creeks, with a total drainage area of 53 square miles, has historically caused damage to agricultural areas and urban development in the flood plains. Twelve damaging floods have occurred since 1930 when streamgages were installed on several of the creeks. The most significant flood, in April 1958, had a peak discharge of 4500 cubic feet per second and reached a gage height of 246.9 feet. An Intermediate Regional Flood would have a peak discharge of 6,400 cfs, reach a height of 250.4 feet, and have channel velocities up to 17 ft/sec and overbank velocities up to 4 ft/sec. A Standard Project Flood would have a peak discharge of 9,400 cfs and reach a height of 251.6 feet. An IRF would result in the inundation of residential and commercial establishments in New Almaden and San Jose. Floods rise to peak in less than 10 hours and remain at critical stage less than 1 day. The flood season is from October to April when floods result from intense rainstorms. Vegetation and many of the 36 bridges and culverts can obstruct flood flows. Three reservoirs in the area can limit the effects of flood waters. The Santa Clara County Flood Control and Water District has an Emergency Operations Center which coordinates flood warning and emergency activities. (Henley - North Carolina)
W76-11349

FLOOD PLAIN INFORMATION: DEER CREEK AND WHITE RIVER, EARLIMART, CALIFORNIA,
Army Engineer District, Sacramento, Calif.
Prepared for Tulare County, California, June 1971. 44 p, 26 fig, 32 plates, 7 tab.

Descriptors: *Flood stages, *Flood profiles, *Flood damage, Flood forecasting, *Flood plain zoning, Floods, Flood flow, Storms, Historic floods, Flood frequency, Peak discharge, Erosion, Flow duration, Deposition, Flood plains, Warning systems, Levees, Reservoirs, *California, Canals.
Identifiers: Earlimart(CA), Tulare County(CA), *Deer Creek(CA), *White River(CA), Standard Project Flood, Intermediate Regional Flood, Pixley(CA).

The portions of Deer Creek and White River covered in this report extend some 20 miles from State Highway 99 upstream to about the foothill line and have a drainage area of 470 square miles. Development in the area is largely agricultural with limited residential development around Earlimart and Pixley. Current population in the area is 4500. Vegetation, levees built by local landowners, 32 bridges and culverts, and the Friant-Kern Canal can obstruct flood flows. Tulare County has adopted a flood plain ordinance providing for secondary and primary floodways. There is an emergency warning system. Floods occur in November through March after exceptionally heavy rains. Historically they have caused heavy damage to orchards, farmland and irrigation systems. Damage resulting from the January 1969 flood was estimated at $1.5 million. An Intermediate Regional Flood would have a peak discharge of 14,000 cubic feet per second on Deer Creek and 7,800 cfs on White River, and have channel velocities reaching 9 to 12 feet per second and overbank flows of 2 to 4 ft/sec causing severe bank erosion. A Standard Project Flood would have a peak discharge of 20,000 cfs on Deer Creek and 10,200 cfs on White River. Floods can be expected to rise in .5 to 1 day and last from 1 to 3 days. (Henley - North Carolina)
W76-11350

FLOOD PLAIN INFORMATION: GREEN VALLEY, DAN WILSON, AND SUISUN CREEKS, CORDELIA, CALIFORNIA.
Army Engineer District, Sacramento, Calif.
Prepared for Solano County, June 1972. 38 p, 18 fig, 16 plates, 5 tab.

Descriptors: *Floods, *Flood profiles, *Historic floods, *Flood protection, Flood flow, Flood forecasting, Flood data, Winds, Tides, Flood frequency, Peak discharge, Flood peak, Flow duration, Bank erosion, Warning systems, Flood plain zoning, Levee, Channel improvement, *California.
Identifiers: Solano County(CA), Cordelia(CA), Green Valley Creek(CA), Dan Wilson Creek(CA), Suisun Creek(CA), Standard Project Flood, Intermediate Regional Flood.

The portions of Green Valley, Dan Wilson, and Suisun Creeks covered in this report have a drainage area of 76 sq mi located east of Napa, northeast of Valejo and due west of Fairfield in Solano County, CA. The area is largely agricultural (crops, orchards, and vineyards) with sparce commercial and residential development in and around Cordelia and Rockville. Area population is 2,000. The flood season is from November to May, the annual period of most intensive rainfall. Floods have historically been of moderate duration and have been most severe when rainfalls coincide with high tides and strong onshore winds. Since 1937 there have been 11 floods. The most severe occurred in 1955 when peak discharges on Suisun Creek reached 5,000 cubic feet per second resulting in streambank erosion and damage to orchards, croplands and livestock. An Intermediate Regional Flood would have a peak discharge of 6,100 cfs on Suisun Creek with channel velocities of 4.7 ft/sec and overbank velocities of 2.4 ft/sec. This flood would remain at peak for 3.5 hours. A Standard Project Flood would have a peak discharge of 7,200 cfs and last up to 11 hours. Twelve bridges, 6 culverts, 2 golf cart crossings and vegetation can obstruct flood flows. Three lakes in the drainage area reduce flood levels. Solano County has flood plain regulations and a flood control project (channel improvements and levees) has been completed along 4.5 miles of Green Valley and Dan Wilson Creeks. (Henley - North Carolina)
W76-11351

FLOOD PLAIN INFORMATION: CACHE LA POUDRE RIVER, COLORADO, VOL. III, FORT COLLINS-GREELEY-LARIMER-WELD COUNTY.
Army Engineer District, Omaha, Nebr.
Prepared for Larimer-Weld Regional Planning Commission, October 1975. 43 p, 16 fig, 19 plates, 9 tab.

Descriptors: *Floods, Flow characteristics, *Flood protection, Dams, *Attenuation, Flood stages, Flow duration, Flood plain zoning, Control structures, *Colorado.
Identifiers: *Cache La Poudre River(CO), Fort Collins(CO), Greeley(CO), Flood plain management, Larimer(CO), Weld County(CO), Intermediate Regional Flood, Standard Project Flood, Flooded areas.

Within this 24 mile reach the Cache La Poudre River flows southeasterly through a well-defined channel averaging about 10 feet deep and bordered by relatively flat flood plain of agricultural and wooded areas. Increasing pressure for development is expected especially at upstream and downstream study limits nearest Fort Collins and Greeley respectively. Primary flood season extends from May through September resulting from intense rainfall with snowmelt runoff a factor during May and June. Although no flood control structures exist in the study area, 2 upstream dams on the river have an effect on flood flow. Weld County has also enacted regulations governing development on the flood plain. Larimer County is expected to enact similar flood plain development regulations. The greatest recorded floods near Fort Collins occurred on June 9, 1891, having a peak discharge of 21,000 cubic feet per second and May 21, 1901, with a peak discharge of 12,000 cfs. Considerable flood discharge attenuation occurs along the river as a result of stream diversion dams which supply river water to irrigation canals, and of natural water storage in areas of intermittent depressions and embankments which occur on the flood plain. Tributary streams such as Boxelder Creek contribute to the flood hazard. Serious debris problems during a flood may be caused by trees and vegetation along the banks. An Intermediate Regional Flood and Standard Project Flood would have estimated peak discharges of 17,500 cfs and 41,000 cfs respectively at the upstream limit with 9,000 cfs and 26,400 cfs respectively at the lower study limits. (Salzman - North Carolina)
W76-11352

FLOOD PLAIN INFORMATION: WABASH RIVER, MIAMI COUNTY AND PERU, INDIANA.
Army Engineer District, Louisville, Ky.
Prepared for the Miami County Commissioners, the City of Peru and the Indiana Department of Natural Resources, June 1973. 33 p, 19 fig, 6 plates, 6 tab.

Descriptors: Floods, *Historic floods, *Flood plains, *Flood damage, Non-structural alternatives, *Flood profiles, Runoff, Flood flow, Flood data, Flood stages, Peak discharges, Flow characteristics, Flood protection, Flood plain zoning, *Indiana.

dentifiers: *Wabash River(IN), Miami County(IN), Peru(IN), Standard Project Flood, Intermediate Regional Flood, Flood plain management.

roperties along the river are primarily rural with esidential, commercial and industrial development in and adjacent to Peru, a trading and rocessing center for the surrounding agricultural rea. The study reach covers a distance of 13.6 iles with flood plains from 1.2 to 2.5 miles in idth. Floods occur during winter and spring esulting from runoff due to intense rainfall. Flood aters in upstream watershed are modified by 3 ood control reservoirs that control 77% of the asin area and reduce likelihood of severe flood-g. A flood wall, levees and railroad embankment rovide some protection. 'Most of the bridges in e study area are obstructive to the Intermediate egional Flood and the Standard Project Flood.' lthough the 1967 land use plan identifies flood lains to remain undeveloped, the City of Peru oes not include flood plain as a land use category hich results in conflict of zoning and building ermit approvals. The greatest flood occurred on arch 26, 1913 when a peak discharge of 115,000 bic feet per second was recorded and damages xceeded $2 million. Because of the reservoir's de-ntion of water, the peak discharges for an Inter-ediate Regional Flood (IRF) and Standard Pro-ct Flood (SPF) are estimated to be 33,200 cfs and ,300 cfs, respectively, inundating residential, mmercial and agricultural properties. The IRF ould crest in about two and a half days and main above bankfull approximately one day. e SPF would peak in about 5 days remaining out banks five days. (Salzman - North Carolina).
76-11353

LOOD PLAIN INFORMATION: POGUES RUN, LEASANT RUN, AND BEAN CREEK, ARION COUNTY, INDIANA.
my Engineer District, Louisville, Ky.
epared for Marion County, Metropolitan nning Department and Indianapolis Flood Con-l District, September 1970. 47 p, 17 fig, 11 tes, 12 tab.

scriptors: Floods, *Flood profiles, *Flood data, od stages, *Peak discharge, Flow charac-istics, *Flood erosion, *Flood plains, *Flood tection, Control structures, Flood flow, Histor-floods, Channels, Non-structural alternatives, diana.
ntifiers: Pogues Run(IN), Pleasant Run(IN), an Creek(IN), Marion County(IN), Indi-polis(IN), Standard Project Flood, Inter-diate Regional Flood.

gues Run, with a drainage of 8.87 sq mi, and asant Run, which drains 21.1 sq mi, flow in a thwesterly direction through Indianapolis. n Creek, drainage area 5.49 sq mi, flows west empties into Pleasant Run. The lower 2.23 es of Pogues Run is enclosed in an underground culvert. Flood plains have residential sections rspersed with industries, parks and cemeteries. od seasons are winter and early spring when eral heavy rains occur. Intense summer and fall derstorms also cause flooding. Stream veloci-may reach 10 feet per second in channel during or floods while overbank velocities seldom ex-l 4 ft/sec. Duration of flood is relatively short e rates of rise are generally high. An extensive d control project is proposed and partially for Pleasant Run and Bean Creek. State and l regulations prohibit floodway construction. greatest flood occurred in May 1956 when a discharge of 2,280 cubic feet per second was rded on Pleasant Run. During an Intermediate onal Flood peak discharges of 4,620 cfs, 6,920 and 3,420 cfs are predicted on Pogues Run, sant Run and Bean Creek respectively. During tandard Project Flood peak discharges of 00, 17,000 and 8,260 cfs are expected on the creeks. (Salzman - North Carolina)
-11354

FLOOD PLAIN INFORMATION: LICK CREEK AND LITTLE BUCK CREEK, MARION COUNTY, INDIANA.
Army Engineer District, Louisville, Ky.
Prepared for Marion County Metropolitan Planning Department and Indianapolis Flood Control District, June 1971. 38 p, 23 fig, 11 plates, 6 tab.

Descriptors: Floods, *Flood plains, *Flood plain zoning, *Flood profiles, *Flash floods, *Flood protection, Land uses, Obstruction to flow, Channel improvements, Flow characteristics, Historic floods, *Indiana.
Identifiers: Lick Creek(IN), Little Buck Creek(IN), Marion County(IN), Standard Project Flood, Intermediate Regional Flood.

The creeks of this study flow generally west and drain adjacent areas on the east side of the West Fork White River. Varying from 200 feet to 1500 feet wide, the flood plains have residential land uses, and undeveloped land. Past floods have inundated portions of this land. Strong residential growth in Perry Township, main basin areas of Lick and Little Buck Creeks, indicates increasing use of flood plain areas in the future. Floods from heavy rains occur primarily from January to April. Intense local thunderstorms can cause flash flooding during any season. Flood duration is relatively short in upper reaches where channel velocities could reach 12 feet per second on Lick Creek and 10 ft/sec on Little Buck Creek. Lower reaches may be flooded for longer periods due to back water effects from West Fork White River. Channel relocation and improvements have been completed on Lick Creek. State legislation requires prior approval of any construction on flood plains. Natural obstructions as well as 74 bridges and one dam could impede flood flow. The largest recorded flood was in July 1969 when 400-500 people in Marion and Johnson counties were forced to flee their homes. Estimated peak discharges for an Intermediate Regional Flood at the mouths of Lick Creek and Little Buck Creek would be 9,200 cubic feet per second and 9,600 cfs respectively. For a Standard Project Flood at the same location peak discharges are estimated at 17,500 cfs and 12,600 cfs respectively. (Salzman - North Carolina)
W76-11355

FLOOD PLAIN INFORMATION: LITTLE ARKANSAS RIVER AND SAND CREEK, SEDGWICK, KANSAS.
Army Engineer District, Tulsa, Okla.
Prepared for the City of Sedgwick, Kansas, April 1974. 31 p, 6 fig, 14 plates, 6 tab.

Descriptors: Floods, *Flood stages, *Flood plains, *Flood protection, Non-structural alternatives, Control structures, *Flood profiles, Runoff, Flood flow, Historic floods, Flood data, Peak discharge, Flow characteristics, Flood damage, Dams, Channel improvement, *Kansas.
Identifiers: Little Arkansas River(KS), Sand Creek(KS), Flood plain management, Sedgwick(KS), Standard Project Flood, Intermediate Regional Flood.

The study reach encompasses 10.5 miles of the Little Arkansas River, a major tributary of the Arkansas River, and 8.5 miles on Sand Creek, a left bank tributary of the Little Arkansas River, with a total drainage area of 1,200 square miles. In gently rolling farmland, the stream valleys are relatively flat with flood plain widths exceeding 2 miles. There are no flood control projects in the study area although Sand Creek has been cleared and enlarged above the study limits. Most floods occur in April through September with relatively fast runoffs in the upper reaches but slower flood runoffs in the lower reaches characterized by less steep slopes. Flows exceed channel capacity at least once a year. The highest known flood occurred on July 6, 1904. The greatest recorded flood, on June 9, 1965, had peak discharges of 9,800 cubic feet per second on Sand Creek and 18,000 cfs on the river. Estimated peak discharges for an Intermediate Regional Flood and Standard Project Flood are 63,000 cfs and 103,900 cfs, respectively on the Little Arkansas River and 17,750 cfs and 32,900 cfs on Sand Creek. With increasing development in the flood plains, now primarily agricultural, damages would be substantial. A proposed plan to build 3 flood water retarding structures and 19 detention dams is outlined. Other guidelines for a flood plain management program are suggested. (Salzman-North Carolina)
W76-11356

FLOOD PLAIN INFORMATION: BIG SANDY RIVER, BOYD COUNTY, KENTUCKY.
Army Engineer District, Huntington, W. Va.
Prepared for the Commonwealth of Kentucky, Department of Natural Resources, May 1972. 39 p, 9 fig, 10 plates, 4 tab.

Descriptors: Floods, *Flood profiles, *Flood plains, Levees, *Floodwalls, Floodwater, Flood flow, Historic floods, Warning systems, Reservoirs, *Kentucky.
Identifiers: *Big Sandy River(KY), Catlettsburg(KY), Lockwood(KY), Burnaugh(KY), Standard Project Flood, Intermediate Regional Flood.

As extensive developed lands lie in the flood plains of the Big Sandy River, large future floods could cause considerable damage to residences, businesses, industry (including an oil refinery, an activated carbon plant, and a chemical plant), and transportation facilities. The Big Sandy joins the Ohio River at Catlettsburg (population 3420 in 1970) and it is backwater effects from the Ohio which cause the most severe flooding. The Big Sandy has a drainage area of 4,290 square miles and is formed by the confluence of Levisa and Tug Forks 105 miles upstream from the Ohio River. Floods from heavy rainfall generally occur in months January through March. Numerous floods causing much damage have occurred on the Big Sandy. By far the largest was the 1937 flood when damage surpassed the sum of $1 million. Water rose 3.5 feet above the current Standard Project Flood level and 7 feet above the Intermediate Regional Flood level. No discharge records are available for these floods. For large floods water velocities of 8 feet per second in the channel and 3 feet per second in the overbank area are anticipated. An Intermediate Regional Flood is expected to rise to peak in 102 hours and last 10 days, while the Standard Project Flood would rise in 158 hours and last 14 days. In comparison, the 1937 flood rose in 274 hours and lasted 18 days. There are no significant obstructions to flood flow across the river. Future flood heights have been considerably reduced by reservoir projects upstream from Catlettsburg which is protected by levees and floodwalls. (Smith-North Carolina)
W76-11357

FLOOD PLAIN INFORMATION: QUINEBAUG RIVER - CADY BROOK, TOWN OF SOUTHBRIDGE, MASSACHUSETTS.
Army Engineer District, Waltham, Mass.
Prepared for the Town of Southbridge, February 1972. 41 p, 6 fig, 7 plates, 9 tab.

Descriptors: Floods, Streamflow forecasting, *Flood data, *Flood stages, Flow characteristics, *Flood plains, *Flood protection, Planning, *Massachusetts, Flood flow, Historic floods, Flow duration, Control structures, Reservoirs, Channel improvement, Dams, Flood profiles, Hurricanes.
Identifiers: *Quinebaug River(MA), Cady Brook(MA), Southbridge(MA), Intermediate Regional Flood, Standard Project Flood, Thames River Basin(MA).

Southbridge, located on the Quinebaug River in southcentral Massachusetts, rests in the upper

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portion of the Thames River Basin. Regulated by 2 dams above the study area, the Quinebaug River drains 744 square miles and flows southeasterly for 5 miles in the study reach through relatively narrow valleys with little development. Near Cady Brook, a tributary of the Quinebaug, there are some industrial and residential areas. Bridges do not generally obstruct flood flows and the 3 low dams allow flood flows to pass. Flooding occurs in the spring and results from heavy rains combined with snowmelt. However, the 2 highest floods resulted from hurricanes. Two reservoirs control 80% of the drainage area and will prevent serious flooding. Other flood damage prevention measures include widening and deepening of the channel of the Cady Brook and construction of concrete retaining walls. The greatest flood occurred in August 1955 and caused more than $18 million damages in Southbridge because of failure of the Glenecho Dam on Cady Brook and the Globe Tool and Die Company Dam on the Quinebaug River. The river had a peak discharge of 36,000 cubic feet per second. An Intermediate Regional Flood and Standard Project Flood would crest at 8.5 feet and 6.8 feet respectively, lower than the 1955 event and have peak discharges of 9,100 cfs and 13,500 cfs on the Quinebaug River at the Southbridge-Dudley town line. This report aids in the solution of local flood problems and in the best utilization of land subject to overflow. (Salzman-North Carolina)
W76-11358

FLOOD PLAIN INFORMATION: MERRIMACK RIVER, CITY OF CONCORD, NEW HAMPSHIRE.
Army Engineer District, Waltham, Mass.
Prepared for the City of Concord, New Hampshire, August 1972. 21 p, 7 fig, 8 plates, 6 tab.

Descriptors: Floods, *Flow duration, Flow characteristics, *Flood plains, *Flood protection, *Flood profiles, *New Hampshire, Historic floods, Flood data, Flood stages, Peak discharge, Rivers, Non-structural alternatives, Planning, Dams, Control structures.
Identifiers: *Merrimack River(NH), Concord(NH), Flood damage reduction measures, Intermediate Regional Flood, Standard Project Flood.

Located in south-central New Hampshire, the Merrimack River, in this study reach, meanders in a horse shoe shaped fashion toward the southeast for 9.8 miles with an average slope of .7 feet per mile. It drains 1,507 square miles above the study area. The flood plains, primarily agricultural areas with some residential and large commercial developments, are .75 to 1.5 miles wide. Floods occur during all seasons but usually result from spring snowmelt in combination with rainfall. Flood flow stages rise slowly and stay above flood stage for long periods of time with high velocities averaging 4 to 6 feet per second in the main channel. There are moderate quantities of floatable materials stored on the flood plains which may be carried away and obstruct bridge openings and damage structures. No flood plain regulations exist. The greatest known flood occurred on March 20, 1936, and had an estimated peak discharge of 122,000 cubic feet per second. Estimated damage was $500,000 in Concord. Other major floods occurred in September 1938, March 1953, April 1960 and April 1969. Beginning with the March 1953 flood, floods have been reduced in severity by regulation of Franklin Falls, Blackwater and Edward MacDowell Dams and Hopkinton-Everett Lakes. An Intermediate Regional Flood and Standard Project Flood would have peak discharges of 46,000 cfs and 92,800 cfs respectively. Damage could be extensive. During an IRF main channel velocities would be 4 to 6 ft/sec with slightly higher velocities in the SPF. Overbank velocities would average 1 to 2 ft/sec and would deposit debris and silt. (Salzman-North Carolina)
W76-11359

FLOOD PLAIN INFORMATION: ALUM CREEK, VICINITY OF COLUMBUS, OHIO.
Army Engineer District, Huntington, W. Va.
Prepared for the State of Ohio Department of Natural Resources, May 1967. 51 p, 14 fig, 8 plates, 2 tab.

Descriptors: Floods, Streamflow forecasting, *Flood data, *Flood plains, *Flood profiles, Peak discharge, Non-structural alternatives, Control structures, Obstructions to flow, Channel improvements, Historic floods, *Ohio.
Identifiers: *Alum Creek(OH), Columbus(OH), Intermediate Regional Flood.

Alum Creek's study reach covers a distance of 23 miles and passes through developed urban and suburban areas of the cities of Columbus, Bexley, and Westerville as well as rural land. Flowing southerly with an average slope of 7.4 feet per mile, the creek has relatively narrow flood plains varying from 300 to 3,000 feet wide. Three low dams and 26 bridges have a minor effect in obstructing flood flows. Channel improvements have been made in some areas and flood plain zoning regulations and flood plain restrictions have been adopted by Columbus and Franklin Counties. A multi-purpose reservoir on Alum Creek in Delaware County was authorized by Congress in 1962. Intended for flood control, water supply and recreation purposes, it should reduce cresting stage about 3 feet below the level of the March 1963 flood. The greatest flood occurred January 22, 1959, cresting at 753.2 feet means sea level (gage zero is 733.62 msl) with an estimated discharge of 26,400 cubic feet per second. Communities in Alum Creek valley were unprepared for the rapid rise of flood waters and suffered extensive flooding over large areas. Damages were $3 million (1959 prices). An Intermediate Regional Flood would be expected to crest at 752.0 feet and have a peak discharge of 22,500 cfs. Structural improvements, reservoirs, levees, flood walls, watershed treatment and planning techniques including zoning subdivision regulations, urban renewal and establishment of open space lands are discussed. (Salzman-North Carolina)
W76-11360

FLOOD PLAIN INFORMATION: SOUTH FORK RIVANNA RIVER, ALBEMARLE COUNTY, VIRGINIA.
Army Engineer District, Norfolk, Va.
Prepared for the Albemarle County Board of Supervisors, March 1973. 18 p, 10 fig, 11 plates, 5 tab.

Descriptors: Floods, *Flood control, *Flood plains, *Flood profiles, Flood protection, *Virginia.
Identifiers: *South Fork Rivanna River(VA), Albemarle County(VA), Charlottesville(VA).

South Fork Rivanna River, northwest of Charlottesville, has a drainage area of 268 square miles. It joins the North Fork to form the Rivanna River which flows 41.55 miles before emptying into the James River. The average slope of the South Fork is 6.6 feet per mile while its tributaries which reach into the Blue Ridge Mountains have much steeper slopes. The narrow flood plain is wooded or open farm land and undeveloped except for several small dams which do not provide flood control. Floods occur during all sons caused by rainfall as well as hurricane activity or from snowmelt in combination with rainfall. The greatest flood, in October, 1942, occurred when about 10 inches of rain fell on the Rivanna River watershed in 3 days as part of a hurricane approached the area, creating extensive flooding in Charlottesville. The most recent flood on February 18, 1960, crested at 12 feet with peak discharge of 6,010 cfs. No flood damage reduction measures exist. An Intermediate Regional Flood (IRF) and Standard Project Flood (SPF) would result in the inundation of mostly agricultural land with peak discharges of 53,400 cfs and 90,000 cfs respectively. Velocities for the SPF will be even higher, possibly reaching 22 ft/sec. Flood stage duration will be 27 hours for IRF, 59 hours for an SPF. This report is to assist in land use planning and in preparing ordinances concerning flood plain utilization, since future development in the area around Charlottesville may encroach on the delineated flood plain. (Salzman-North Carolina)
W76-11361

SNOWMELT RUNOFF FROM PLANTED CONIFERS IN SOUTHWESTERN WISCONSIN.
Forest Service (USDA), St. Paul, Minn. North Central Forest Experiment Station.
R. S. Sartz, and D. N. Tolsted
USDA Research Note NC-205, 2 p, 1976. 4 ref, 2 tab.

Descriptors: *Snowmelt, *Runoff, *Forest watersheds, *Wisconsin, *Conifers, Snowpack, Overland flow, Pine trees, Watersheds(Basins), Frost, Infiltration, Slopes
Identifiers: Red pine(Pinus resinosa), Norway spruce(Picea abies), European larch(Larix decidua), Spruce trees, Larch trees

Snowmelt overland flow was measured for one season from 10-year-old plantations of red pine (Pinus resinosa), Norway spruce (Picea abies), European larch (Larix decidua), and from old field control plots, on both north and south slopes, in southwestern Wisconsin. Pine and spruce plots produced more runoff than larch and old field plots; and south slope plots produced more runoff than north slope plots. (Witt-IPC)
W76-11369

STATISTICAL SUMMARIES OF INDIANA STREAMFLOW DATA,
Geological Survey, Indianapolis, Ind.
For primary bibliographic entry see Field 7C.
W76-11409

HYDROLOGIC RECORDS FOR LAKE COUNTY, FLORIDA, 1973-74,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 7C.
W76-11414

BENEATH THE TENN-TOM,
Geological Survey, Nashville, Tenn.
J. Van Brahana.
Water Spectrum, Vol 7, No 4, p 17-24, Winter 1975-76.

Descriptors: *Baseline studies, *Water resources, *Water quality, *River training, *Tennessee River, Projections, Surface waters, Groundwater, Construction, Inland wateways, River systems, Ships, Hydrologic systems, Environmental effects, Data collections, Evaluation.
Identifiers: *Tennessee-Tombigbee Waterway project.

A new waterway soon will connect the inland Tennessee River system with the Gulf of Mexico via the Black Warrior Waterway, shortening some shipping distances as much as 800 miles and extensively modifying the surface-water flow characteristics over a 2,000-square-mile area. Test holes were drilled at strategic locations along the proposed route to aid in defining the existing flow system. Some of the changes in the water quality of surface water that may occur during construction and others that may result from subsequent operation activity include: increase in sediment loads, increase in turbidity, pH change in vicinity of fresh cuts, thermal stratification in deep impoundments, introduction and concentration of minor metals, decrease in dissolved oxygen, increase in wastes from developing areas, change in nutrient loading, and contamination from accidental spills of material being transported. Some of these effects on the quality of the surface wa

may be transmitted to interconnected aquifers and thereby change ground-water quality. Water levels will be raised along 90 percent of the waterway, enhancing opportunities for ground-water development in adjoining areas. In the remaining 10 percent, which is the cut in the divide section, water levels will be lowered about 100 feet adjacent to the cut near its midpoint but closely approach the original levels at the north and south ends of this reach. (Woodard-USGS)
W76-11415

PROGRAMMABLE CALCULATORS: MODERN INSTRUMENTS FOR ANALYZING HYDROLOGIC DATA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 7B.
W76-11416

WATER CURRENT FORCE MEASURING APPARATUS,
For primary bibliographic entry see Field 7B.
W76-11444

HYPOLIMNION OXYGENATION,
Union Carbide Corp., New York. (Assignee).
For primary bibliographic entry see Field 5G.
W76-11454

HYDRAULIC MODEL STUDIES OF MECHANICAL MIXING DEVICES IN STRATIFIED LAKES,
Oklahoma State Univ., Stillwater. School of Mechanical and Aerospace Engineering.
For primary bibliographic entry see Field 8B.
W76-11495

THE POTENTIAL IMPACT OF SATELLITE DATA-RELAY SYSTEMS ON THE OPERATION OF HYDROLOGIC DATA PROGRAMS,
Geological Survey, Reston, Va. ; and Geological Survey, Bay Saint Louis, Miss.
For primary bibliographic entry see Field 7B.
W76-11497

INFORMATION TRANSFER FOR STREAM DISCHARGE,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7A.
W76-11499

SCOUR AND FILL PATTERNS IN POOL-RAPID RIVERS,
Arizona Univ., Tucson. Dept. of Civil Engineering and Engineering Mechanics.
For primary bibliographic entry see Field 2J.
W76-11511

SEDIMENT YIELD AS RELATED TO A STOCHASTIC MODEL OF EPHERMERAL RUNOFF,
Agricultural Research Service, Tucson, Ariz. Southwest Watershed Research Center.
For primary bibliographic entry see Field 2J.
W76-11512

MANAGEMENT OF WATER RESOURCES UNDER DIFFERENT SOCIO-ECONOMIC CONDITIONS,
Arizona University, Tucson, Committee on Arid Lands Resources.
For primary bibliographic entry see Field 6B.
W76-11514

RIPARIAN DENDROCHRONOLOGY: A METHOD FOR DETERMINING FLOOD HISTORIES OF UNGAGED WATERSHEDS,
Arizona Univ., Tucson. Lab. of Tree-Ring Research.
C. W. Stockton, and D. Laing.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-256 967, $3.50 in paper copy, $3.00 in microfiche. Completion Report, August 1976. 18 p, 4 fig, 4 tab, 10 ref. OWRT A-058-ARIZ(1). 14-34-0001-6003.

Descriptors: *Dendrochronology, *Flood damage, *Flood frequency, *Land use, History, Dating, Snowpack, Plant growth, Watershed management, Arizona, Utah, Colorado.
Identifiers: *Crossdating, *Riparian zone, *Tree growth.

Examination of 106 crossdated tree-ring cores from the riparian zone of Pine Creek near Escalante, Utah, 10 cores from Bright Angel Creek, Grand Canyon, Arizona, 8 cores from South Taylor Creek, Zion National Park, Utah, and 5 cores from the Animas River near Silverton, Colorado, has yielded the following information: (1) Various riparian gymnosperm and angiosperm species crossdate with semi-arid site gymnosperms. (2) Tree growth is best correlated with snowpack water equivalent. (3) Flood damage to trees is manifested in growth suppression on root exposure or burial, in reaction wood on tilting, and in scarring. (4) Flood damage is very infrequent at Pine Creek from 1700 to 1880, more so from 1880 to 1909, and very frequent from 1909 to the present. (The town of Escalante was settled in 1875, and stocking of the range around Pine Creek reached a maximum shortly after 1900). (5) Flood damage shows fairly constant frequency in the Bright Angel Creek watershed, which has seen little land use. (6) Flood damage on South Taylor Creek shows a marked increase in frequency between about 1900 and 1937 when the region was included in Zion National Monument, after which flood damage declined markedly in frequency.
W76-11523

URBAN STORMWATER MANAGEMENT MODELING AND DECISION-MAKING,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
For primary bibliographic entry see Field 5D.
W76-11599

FIRST THE WATER, THEN THE SEWER, THEN LAND USE PLANNING: COASTAL PLANNING IN RETROSPECT AND IN THE NOW,
North Carolina State Planning Div., Raleigh.
For primary bibliographic entry see Field 5D.
W76-11622

4B. Groundwater Management

INTERNATIONAL ASSOCIATION OF DRILLING CONTRACTORS DRILLING MANUAL,
International Association of Drilling Contractors, Houston, Tex. Rotary Drilling Committee.
For primary bibliographic entry see Field 8C.
W76-11102

TOXIC HEAVY METALS IN GROUND WATER OF A PORTION OF THE FRONT RANGE MINERAL BELT,
Colorado School of Mines Golden. Dept. of Chemistry; and Colorado School of Mines, Golden. Dept. of Geochemistry.
For primary bibliographic entry see Field 5B.
W76-11105

MECHANISMS OF LEACHATE FORMATION IN SANITARY LANDFILLS,
University of Southern California, Los Angeles. Environmental Engineering Program.
For primary bibliographic entry see Field 5B.
W76-11118

UNDERGROUND STORAGE OF STATE WATER PROJECT SUPPLY, A PROGRESS REPORT,
Los Angeles City Dept. of Water and Power. Aqueduct Div.
D. L. Georgeson.
In: Proceedings, Tenth Biennial Conference on Ground Water, September 11-12, 1975, Ventura, California, p 9-11.

Descriptors: *Storage capacity, *Underground storage, *Groundwater basins, Pumped storage, Resource development, Groundwater, Wells, Groundwater mining, *California.
Identifiers: State Water Project, *Dewatered aquifers, *Groundwater basin inventory, Groundwater basin storage capacity, Pumping facilities, Southern California.

During the last two years, the Southern California Water Conference has studied the engineering, legal and institutional feasibility of implementing the storage of State Water Project supplies in the dewatered space available in southern California's ground water basins. A basin-by-basin inventory was taken to determine the capability of each ground-water basin to store State Project water. The inventory indicated that approximately 4,535,000 acre-feet of dewatered basin capacity was available. In addition it was determined that there was approximately 4,582,000 acre-feet of water already in storage in ground-water basins which could be extracted using present facilities, and approximately 3,573,000 acre-feet of water which could be extracted with modification of present-day facilities. A coincident study entitled 'Ground Water Storage of State Water Project Supplies' reported that the State Water Project had the capability to convey 2,610,000 acre-feet of State Project water to southern California during the period 1975 through 1982. A third activity was the work of a legal and institutional subcommittee which drafted an agreement for delivery and use of State Project water. (Heiss-NWWA)
W76-11119

BELGIUM (LEGISLATION ON UNDERGROUND WATERS).
Food and Agriculture Organization of the United Nations, Rome (Italy).
For primary bibliographic entry see Field 6E.
W76-11120

ENGLAND AND WALES, (LEGISLATION ON UNDERGROUND WATERS).
Food and Agricultural Organization of the United Nations, Rome (Italy).
For primary bibliographic entry see Field 6E.
W76-11121

FRANCE, (LEGISLATION ON UNDERGROUND WATERS).
Food and Agricultural Organization of the United States, Rome (Italy).
For primary bibliographic entry see Field 6E.
W76-11122

ISRAEL, (LEGISLATION ON UNDERGROUND WATERS).
Food and Agricultural Organization of the United Nations, Rome (Italy).
For primary bibliographic entry see Field 6E.
W76-11123

ITALY, (LEGISLATION ON UNDERGROUND WATERS).
Food and Agricultural Organization of the United Nations, Rome (Italy).
For primary bibliographic entry see Field 6E.
W76-11124

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SPAIN, (LEGISLATION ON UNDERGROUND WATERS).
Food and Agricultural Organization of the United Nations, Rome (Italy).
For primary bibliographic entry see Field 6E.
W76-11125

TURKEY, (LEGISLATION ON UNDERGROUND WATERS).
Food and Agricultural Organization of the United States, Rome (Italy).
For primary bibliographic entry see Field 6E.
W76-11126

SYSTEMATIC DEVELOPMENT OF METHODOLOGIES IN PLANNING URBAN WATER RESOURCES FOR MEDIUM SIZE COMMUNITIES. PHASE I. FINAL REPORT,
Purdue University, West Lafayette, Indiana, Water Resources Research Center.
For primary bibliographic entry see Field 6B.
W76-11175

SYSTEMATIC DEVELOPMENT OF METHODOLOGIES IN PLANNING URBAN WATER RESOURCES FOR MEDIUM SIZE COMMUNITIES: REGIONAL AQUIFER EVALUATION STUDIES WITH STOCHASTIC INPUTS,
Purdue University, West Lafayette, Indiana, Water Resources Research Center.
For primary bibliographic entry see Field 6B.
W76-11176

SHALLOW SUBSURFACE DISPOSAL OF WASTEWATER,
North Carolina Dept. of Natural and Economic Resources. Div. of Environmental Management.
For primary bibliographic entry see Field 5E.
W76-11228

TOWARDS A COMPUTER-BASED INFORMATION MONITORING SYSTEM FOR GROUNDWATER DATA IN NEW ZEALAND,
Illinois Univ. at Chicago Circle. Dept. of Geological Sciences.
R. B. McCammon.
In: International Conference on Environmental Sensing and Assessment, Vol. 2, September 14-19, 1975, Las Vegas, Nevada, p 31-6-1 - 31-6-5. 2 fig, 4 ref.

Descriptors: *Data storage and retrieval, *Computer programs, *Data collections, *Groundwater, *Water quality, Data processing, Wells, Water sampling, Monitoring.
Identifiers: *New Zealand.

The development of a computer-based information retrieval system for groundwater data in New Zealand is discussed. Currently there are over 20,000 water well records on file in New Zealand dealing with information obtained from drilling, subsequent test pumping, and water quality analyses. Thus, the need exists for developing a computerized storage and retrieval system. Three types of computer dialogues are currently being considered: question-and-answer types, menu-selection types, and natural-English dialogues. The importance of involving potential users in the development of the groundwater information system is stressed. (See also W76-10637) (Kreager-FIRL)
W76-11247

PUERTO RICO: ALONG THE ROUTE OF WATER REUSE,
Environmental Protection Agency, San Juan, Puerto Rico.
For primary bibliographic entry see Field 5D.
W76-11259

COMPUTER PROGRAM FOR THREE-DIMENSIONAL PLOTTINGS FROM IRREGULAR FINITE ELEMENT GRID,
California Univ., Davis. Dept. of Land, Air and Water Resources.
For primary bibliographic entry see Field 2F.
W76-11327

SOME ISSUES REGARDING REGULATORY POLICY, POLITICAL PARTICIPATION, AND SOCIAL IMPLICATIONS OF GEOTHERMAL RESOURCE DEVELOPMENT IN THE IMPERIAL VALLEY,
Center for Social and Behavioral Science Research. University, Riverside, California.
For primary bibliographic entry see Field 6E.
W76-11328

AN EXPERIMENTAL HIGH-ASH PAPER MILL SLUDGE LANDFILL,
Michigan State Univ., East Lansing.
For primary bibliographic entry see Field 5E.
W76-11379

GROUND-WATER RECORDS FOR NORTHEASTERN OKLAHOMA: PART 1--RECORDS OF WELLS, TEST-HOLES, AND SPRINGS,
Geological Survey, Oklahoma City, Okla.
For primary bibliographic entry see Field 7C.
W76-11412

BENEATH THE TENN-TOM,
Geological Survey, Nashville, Tenn.
For primary bibliographic entry see Field 4A.
W76-11415

GROUND-WATER FLOW AND POLLUTION AT A WELL FIELD, OLEAN, NEW YORK,
Geological Survey, Albany, N. Y.
For primary bibliographic entry see Field 5B.
W76-11417

FEASIBILITY OF MODELLING THE INFLUENCES OF PIT RECHARGE ON GROUNDWATER LEVELS AND QUALITY IN ALLUVIAL BASINS,
Water Resources Research Center, Tucson.
For primary bibliographic entry see Field 2F.
W76-11487

PROCEEDINGS TENTH BIENNIAL CONFERENCE ON GROUND WATER, TOTAL WATER MANAGEMENT FOR CALIFORNIA'S LONG-RANGE NEEDS.
California State Dept. of Water Resources, Scramento.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-256 808, $9.00 in paper copy, $3.00 in microfiche. California Water Resources Center, Davis, Report No. 33, December 1975. 257 p. Held at Ventura, California, September 11-12, 1975. Edited by Frank T. Bragg.

Descriptors: *Groundwater, *Water management(Applied), *Water supply, Water reuse, Planning, Water utilization, *Conferences, Legal aspects, Regulation, Water quality, *California, *Conjunctive use, Water conservation.

The conference, co-sponsored by the California Dept. of Water Resources and the California Water Resources Center, included papers under the following session topics: Innovation in Conjunctive Use of Ground and Surface Water; Ground Water Conservation, Protection and Use--Some Technical and Institutional Considerations; Energy and Economic Considerations in the Use and Development of Ground Water; and Legal and Regulatory Aspects. (Snyder - California, Davis)
W76-11491

GEOPHYSICAL PROSPECTING FOR GROUND WATER IN ALASKA.
Geological Survey, Denver, Colo.
H. Ackermann
Geological Survey Earthquake Information Bulletin, Vol 8, No 2, p 18-20, March-April 1976. 4 fig.

Descriptors: *Geological surveys, *Groundwater resources, *Alaska, *Seismic studies, *Electrical resistance, Explosives, Exploration, Seismographs, Locating, Groundwater, Water supply, Methodology.

For several years the U. S. Geological Survey has been assisting the Air Force in locating water supplies in frozen areas of Alaska. Two geophysical prospecting methods, seismic refraction and electrical resistivity, complement each other in exploring for ground water in frozen areas because both electrical resistivity and seismic velocity have large values in frozen earth. Similarly, velocities and resistivities are high in areas of shallow unfractured rock. Consequently, areas of frozen earth and unfractured (nonporous) rocks are to be avoided for a potential water supply. The trick then is to locate subsurface zones of lower seismic velocity and electrical resistivity because these are likely water reservoirs. These layers may be water-saturated permeable rock, glacial material, alluvium, or fault gouge. Once located, such zones are prospected in great detail so that a precise location for a drill hole or gallery can be recommended. (Woodard-USGS)
W76-11496

DEEP WELL DISPOSAL OF WASTEWATER,
Environmental Protection Agency, Atlanta, Ga. Region IV.
For primary bibliographic entry see Field 5E.
W76-11617

GROUNDWATER SUPPLIES OF THE COASTAL REGION,
For primary bibliographic entry see Field 5F.
W76-11618

WASTEWATER REUSE IN COASTAL AREAS,
North Carolina Univ. at Chapel Hill. Dept. of Environmental Sciences and Engineering.
For primary bibliographic entry see Field 5D.
W76-11620

IMPACT OF WATER SUPPLY AND WASTEWATER ON THE COASTAL AND MARINE ENVIRONMENTS,
North Carolina State Univ., Raleigh. Sea Grant Program.
For primary bibliographic entry see Field 5D.
W76-11625

4C. Effects On Water Of Man's Non-Water Activities

THE IMPACT OF SUBURBANIZATION ON STREAM NETWORKS,
Iowa Univ., Iowa City. Inst. of Urban and Regional Research.
W. L. Graf.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-256 22[illegible] $4.00 in paper copy, $3.00 in microfiche. Final Report 14, (ISWRRI-75), June 1976. 34 p., 7 fig., tab, 23 ref. OWRT A-059-IA(1).

Descriptors: *Streams, *Iowa, *Urbanization, *Hydrographs, Channels, Open channels, Cities, *Suburban areas, Networks, Drainage basins, Flash floods.
Identifiers: Iowa City(Iowa), *Channel networks, Kurtosis, Storm hydrographs.

nalysis of geomorphic, hydrologic, and suburnization data from a small instrumented ainage basin near Iowa City, Iowa, indicates that annel networks are radically altered when subban development overtakes a drainage basin. ange in channel networks are generally such at the network becomes much more efficient in llecting water quickly, so that lag time and kursis of storm hydrographs are altered to produce e familiar flash floods of urban areas. The data ow that network change are most closely asciated with kurtosis of storm hydrographs, and ggest that corrective measures be concentrated the internal linkages of the network.
76-11113

ILORIDE MANAGEMENT IN LAKE ERIE SIN,
te Univ. of New York at Buffalo. Dept. of Civil gineering.
r primary bibliographic entry see Field 5B.
76-11114

DROLOGIC DATA FOR URBAN STUDIES THE SAN ANTONIO, TEXAS TROPOLITAN AREA, 1974,
ological Survey, Austin, Tex.
r primary bibliographic entry see Field 7C.
76-11413

TTON'S SHEARWATERS INITIATING CAL SOIL EROSION IN THE SEAWARD IKOURA RANGE,
rest and Range Experiment Station, Rangiora w Zealand).
primary bibliographic entry see Field 2J.
6-11518

. Watershed Protection

FECT OF PLANTATION ESTABLISHMENT SOIL AND SOIL WATER IN UTHWESTERN WISCONSIN,
est Service (USDA), St. Paul, Minn. North tral Forest Experiment Station.
. Sartz.
DA Research Paper NC-127, 8 p, October. 5. 2 fig, 20 ref, 7 tab.

criptors: *Groundwater, *Soil moisture, atershed management, *Forest watersheds, trees, *Wisconsin, Soil density, Soil chemis- Soils, Carbon, Nitrogen compounds, Surface off, Freezing, Springs, Streamflow, Erosion rol, Soil water, Snowmelt, Snowpack, Slopes, ifers, Storm runoff.
tifiers: Eastern white pine(Pinus strobus), pine(Pinus resinosa), White spruce(Picea ca), European larch(Larix decidua), Spruce s.

tations of eastern white pine (Pinus strobus), pine (P. resinosa), white spruce (Picea glauca), European larch (Larix decidua) were blished on three sites in southwestern Wisconnd the changes in letter weight, soil bulk den- soil nitrogen and organic carbon contents, water depletion, and snowpack accumulation evaluated over 14 years of growth. The sites ded an upper northern slope of 10 percent, a r north slope of 25 percent, and a middle n slope of 25 percent. The greater amounts of that built up under larch would seem to make preferred species for watershed management ing; however, the additional litter may have alue in preventing rainfall runoff. It may ce soil freezing, which could reduce snowmelt ff. The plantations are not yet old enough to reduced soil bulk density. By the 10th year, ine and larch plantings were using substan- more water from the top meter of soil than nplanted control, and a little more than a al hardwood forest. The additional water depleted by the trees can reduce flood runoff potential from summer storms, but on the other hand, this may reduce the contribution to groundwater, springflow, or stream base flow, which would have a negative effect of water production. (Witt-IPC)
W76-11365

SNOWMELT RUNOFF FROM PLANTED CONIFERS IN SOUTHWESTERN WISCONSIN,
Forest Service (USDA), St. Paul, Minn. North Central Forest Experiment Station.
For primary bibliographic entry see Field 4A.
W76-11369

AGRICULTURE AND CLEAN WATER--PROCEEDINGS OF A CONFERENCE TO EXPLORE CONTROL STRATEGY FOR AGRICULTURAL NONPOINT SOURCE WATER POLLUTION.
For primary bibliographic entry see Field 5G.
W76-11406

WATER QUALITY OF STREAMFLOW FROM PONDEROSA PINE FOREST WATERSHEDS ON SEDIMENTARY SOILS,
Arizona Univ., Tucson. School of Renewable Natural Resources.
For primary bibliographic entry see Field 5A.
W76-11490

INFLUENCE OF SIMPLIFICATIONS IN WATERSHED GEOMETRY IN SIMULATION OF SURFACE RUNOFF,
Agricultural Research Service, Tucson, Ariz.
For primary bibliographic entry see Field 2A.
W76-11517

RIPARIAN DENDROCHRONOLOGY: A METHOD FOR DETERMINING FLOOD HISTORIES OF UNGAGED WATERSHEDS,
Arizona Univ., Tucson. Lab. of Tree-Ring Research.
For primary bibliographic entry see Field 4A.
W76-11523

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

TOXIC HEAVY METALS IN GROUND WATER OF A PORTION OF THE FRONT RANGE MINERAL BELT,
Colorado School of Mines Golden. Dept. of Chemistry; and Colorado School of Mines, Golden. Dept. of Geochemistry.
For primary bibliographic entry see Field 5B.
W76-11105

CADMIUM UPTAKE BY MARINE FISH LARVAE,
Bundesforschungsanstalt fuer Fischerei, Hamburg (West Germany). Institut fuer Kuesten- und Binnenfischerei.
For primary bibliographic entry see Field 5C.
W76-11184

ECOLOGY OF THE LITTORAL POLYCHAETE STREPTOSYLLIS WEBSTERI, A NEW SPECIES IN THE BALTIC,
Morski Instytut Rybacki, Gdynia (Poland).
For primary bibliographic entry see Field 5B.
W76-11186

THE TOXICITY OF THE HERBICIDE DICHLOBENIL TO GOLDFISH (CARASSIUS AURATUS),
Utrecht Rijksuniversiteit (Netherlands). Inst. of Veterinary Pharmacology and Biological Toxicology.
For primary bibliographic entry see Field 5C.
W76-11188

ACUTE TOXICITY OF CERTAIN PESTICIDES TO ACARTIA TONSA DANA,
Hazleton Labs. America, Inc., Vienna, Va.
For primary bibliographic entry see Field 5C.
W76-11193

DESIGN OF POLLUTANT ORIENTED INTEGRATED MONITORING SYSTEMS,
Environmental Protection Agency, Las Vegas, Nev.
For primary bibliographic entry see Field 7B.
W76-11238

PROBLEMS IN ANALYSES OF ORGANIC POLLUTANTS IN OPEN-OCEAN SAMPLES,
Texas A and M Univ., College Station. Dept. of Chemistry.
C. S. Giam, H. S. Chan, and G. S. Neff.
In: International Conference on Environmental Sensing and Assessment, Vol. 2, September 14-19, 1975, Las Vegas, Nevada, p 21-1-1 - 21-1-3. 3 tab, 3 ref.

Descriptors: *Pollutant identification, *Organic compounds, *Analytical techniques, *Sampling, Equipment, *Quality control, *Sea water, DDT, Polychlorinated biphenyls, Chlorinated hydrocarbon pesticides, Water analysis.
Identifiers: Phthalate ester plastizers, Sample collection, Laboratory reagents.

Techniques for avoiding the contamination of open-ocean samples during collection and analysis for organic pollutants are discussed. General precautions against contamination include: concentrating an aliquot of each bottle of reagent used in the procedure; the removal of organics from laboratory tap water by liquid-liquid extraction; the cleaning of solid reagents by heating; the purification of gases used to evaporate solvents by passage through a molecular sieve or other suitable trap; the use of equipment made from glass, teflon, or metal; the avoidance of materials made from plastics, rubber, and cork; the use of a minimum amount of equipment; and the performance of frequent procedure blanks. Selected results of analyses performed on samples from the Gulf of Mexico are presented for DDT, polychlorinated biphenyl, and phthalate ester plastizers to illustrate the efficacy of such precautions. (See also W76-10637) (Kreager-FIRL)
W76-11239

THE MEANING AND MEASUREMENT OF TURBIDITY,
National Oceanographic Instrumentation Center, Washington, D.C.
B. S. Pijanowski.
In: International Conference on Environmental Sensing and Assessment, Vol. 2, September 14-19, 1975, Las Vegas, Nevada, p 21-6-1 - 21-6-5. 6 fig, 13 ref.

Descriptors: *Analytical techniques, *Turbidity, *Water quality, *Optical properties, *Suspended solids, Physical properties, *Measurement, Instrumentation, Equipment, Calibrations.
Identifiers: Transmissometers, Nephelometers, Ambient light meters, Jackson candle turbidimeter.

Problems associated with the use of turbidity as an optical indicator of water quality are discussed along with recommendations of a workshop on turbidity sponsored by the National Oceano-

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graphic Instrumentation Center. The term turbidity is recommended for use only as a qualitative descriptor and not as a parameter for measurement. The concept of turbidity is optical and in a broad sense is an indication of suspended particulate matter. A single optical measurement cannot be used to measure suspended particulates in general because the optical characteristics of the particulates are complex functions of particle size and shape, absorption, and other parameters. It is recommended that when optical measurements are made they be identified with the type of instrument used and that the instruments not be calibrated in artificial units as is the common practice currently. Conceptual descriptions of the following types of turbidity measuring instrumentation are provided: the Jackson Candle turbidimeter, transmissometers, nephelometers, and ambient light meters. Accepted methods for turbidity measurements and instrument calibration are also outlined. (See also W76-10637) (Kreager-FIRL)
W76-11240

THE ENVIRONMENTAL INFORMATION SYSTEM (EIS) IN SWEDEN AND MONITORING OF THE ENVIRONMENT,
Swedish Council of Environmental Information, Stockholm. Jordbruksdepartementet.
I. Palmlund, and I. Andersson.
In: International Conference on Environmental Sensing and Assessment, Vol. 2, September 14-19, 1975, Las Vegas, Nevada, p 25-2-1 - 25-2-3. 1 fig, 1 tab.

Descriptors: *Data collections, *Data processing, *Information retrieval, *Monitoring, Programs, Measurement, *Pollutant identification, Methodology, Environment.
Identifiers: *Sweden, *Environmental information systems.

The structure of the Swedish Environmental Information System is outlined. The system is designed to provide coordinated and standardized data collection concerning air, water, and ground quality in both polluted and unpolluted areas. Information concerning products and chemical substances subject to control, major polluting sources, and research and data collection activities throughout the country is also provided by the system. The development of the Environmental Information System is now in progress under the direction of the Swedish Council of Environmental Information which is also planning a study of the coordinated utilization of the Environmental Information System and meteorological, hydrological, and other data bases. (See also W76-10637) (Kreager-FIRL)
W76-11241

ANALYSIS OF ORGANIC POLLUTANTS IN DRINKING WATER,
Drexel Univ., Philadelphia, Pa. Dept. of Chemistry.
I. H. Suffet, and J. V. Radziul.
In: International Conference on Environmental Sensing and Assessment, Vol. 2, September 14-19, 1975, Las Vegas, Nevada, p 30-1-1 - 30-1-7. 5 fig, 4 tab, 23 ref.

Descriptors: *Analytical techniques, *Separation techniques, *Pollutant identification, *Potable water, *Organic compounds, Gas chromatography, Mass spectrometry, Ethers, Water analysis.
Identifiers: Chlorinated hydrocarbons, Aromatic hydrocarbons, Chloroform, Trichloroacetone, Acetones, Chlorinated alkanes, Precursor compounds, Bis(2-chloroethyl)ether, Benzenes.

Isolation techniques and analytical method for the determination of organic compounds in drinking water are discussed. Isolation techniques covered include: liquid-vapor phase isolation in the form of head gas analysis, liquid-liquid phase isolation in the form of solvent extraction, liquid-solid phase isolation in the form of carbon adsorption, and absorption by macroreticular resins. Analytical approaches are discussed in terms of quantitative and general screening methods. The development of quantitative analysis techniques for bis(2-chloroethyl)ether, chloroform are described along with the use of gas chromatography/mass spectrometry for the identification of organic compounds in Philadelphia drinking water. A list of 20 organic compounds found in the drinking water is presented and reveals the presence of 1,1,1-trichloroacetone, a precursor of chloroform. A constant background of hydrocarbon substituted benzene and chlorinated alkanes is also observed for the drinking water sample. (See also W76-10637) (Kreager-FIRL)
W76-11242

FLUORESCENCE MEASUREMENTS OF CARCINOGENIC AND POLYCYCLIC AROMATIC HYDROCARBONS IN WATER,
National Bureau of Standards, Washington, D.C. Inst. for Materials Research.
F. P. Schwartz, and S. P. Wasik.
In: International Conference on Environmental Sensing and Assessment, Vol. 2, September 14-19, 1975, Las Vegas, Nevada, p 30-2-1 - 30-2-5. 5 fig, 10 ref.

Descriptors: *Fluorescence, *Spectrophotometry, *Pollutant identification, *Aromatic compounds, Analytical techniques, Feasibility studies, Evaluation, Sea water, Water analysis.
Identifiers: *Polynuclear aromatic hydrocarbons, *Carcinogens, Naphthalene, Anthracene, Pyrene, Fluoranthene.

The feasibility of using fluorescence spectrometry for determining carcinogenic and polycyclic aromatic hydrocarbons in water was investigated. At naperian absorbances of less than or equal to 0.05, the fluorescence intensities of solutions containing naphthalene, anthracene, pyrene, and fluoranthene in water were a superposition of the component fluorescence spectra. The fluorescence spectra varied unpredictably with concentration when viewed perpendicular to the excitation light and at higher polynuclear aromatic optical densities in the mg/liter range. Polynuclear aromatic fluorescence intensity was not affected by the presence of sodium chloride at sea water concentrations or by the presence of mg/liter concentrations of iron, zinc, cobalt, or nickel cations in water. (See also W76-10637) (Kreager-FIRL)
W76-11243

MONITORING FOR ORGANIC POLLUTANTS IN GREAT BRITAIN,
Analysis Automation Ltd., Oxford (England).
A. Verdin.
In: International Conference on Environmental Sensing and Assessment, Vol. 2, September 14-19, 1975, Las Vegas, Nevada, p 30-3-1 - 30-3-3. 5 fig, 19 ref.

Descriptors: *Monitoring, *Water quality, *Effluents, *Organic compounds, *Analytical techniques, Instrumentation, Equipment, Measurement, Biochemical oxygen demand, Chemical oxygen demand, Carbon, Gas chromatography, Mass spectrometry, Ultraviolet radiation, Oil, *Pollutant identification.
Identifiers: Great Britain.

Water and air pollution monitoring activities in Great Britain are reviewed. Although the basic parameter in British water treatment is the 5-day biochemical oxygen demand value which is not amenable to adaption for continuous monitoring, a number of commercial systems for chemical oxygen demand and other measurements are being used for effluent monitoring. A simple on-line device which uses the correlation between total organic carbon or biochemical oxygen demand and ultraviolet absorption at 254 nanometers has also been developed. An oil-in-water monitor which uses the single beam ultraviolet absorption principle and sophisticated sample conditioning system is being used at a North Sea oil facility. Extensive multiparameter water quality networks are being developed in Britain, although they do not include any organics monitors yet. Individual organics are analyzed in grab samples by gas chromatography and mass spectrometry. (See also W76-10637) (Kreager-FIRL)
W76-11244

ENVIRONMENTAL INDICES AND MONITORING,
Department of the Environment, Ottawa (Ontario). Science Policy Branch.
H. Inhaber.
In: International Conference on Environmental Sensing and Assessment, Vol. 2, September 14-19, 1975, Las Vegas, Nevada, p 31-1-1 - 31-1-3. 6 ref.

Descriptors: *Monitoring, *Data collections, *Data processing, *Indicators, Measurement, Evaluation, Analytical techniques, Environment, *Pollutant identification.
Identifiers: Environmental indices.

The usefulness of environmental indices is discussed along with their relationship to monitoring. Environmental indices compare the actual state of part of the environment to a desirable standard. Since indices are only as good as the data on which they are based, their usefulness depends on adequate and accurate monitoring facilities. The use of environmental indices can indirectly diminish problems associated with overlapping monitoring policies and networks since they provide a goal for monitoring activities. Indices also tend to speed up the processing and reporting of environmental data since their purpose is to inform the public on the state of the environment. Since environmental indices tend to regularize the collection of data, problems associated with assessing the synergistic effects of pollutants are diminished by the use of indices. (See also W76-10637) (Kreager-FIRL)
W76-11245

SOME PRACTICAL PROBLEMS IN DEVELOPING AND PRESENTING ENVIRONMENTAL QUALITY INDICES TO THE PUBLIC,
Environmental Protection Agency, Seattle, Wash. Region X.
For primary bibliographic entry see Field 5G.
W76-11246

TOWARDS A COMPUTER-BASED INFORMATION MONITORING SYSTEM FOR GROUNDWATER DATA IN NEW ZEALAND,
Illinois Univ. at Chicago Circle. Dept. of Geological Sciences.
For primary bibliographic entry see Field 4B.
W76-11247

X-RAY DIFFRACTION AND ELECTRON BEAM ANALYSIS OF ASBESTIFORM MINERALS IN LAKE SUPERIOR WATERS,
National Water Quality Lab., Duluth, Minn.
P. M. Cook, I. B. Rubin, C. J. Maggiore, and W. Nicholson.
In: International Conference on Environmental Sensing and Assessment, Vol. 2, September 14-19, 1975, Las Vegas, Nevada, p 34-1-1 - 34-1-9. 7 fig, 1 tab, 12 ref.

Descriptors: *Asbestos, *Lake Superior, *Electron microscopy, *Potable water, *X-ray diffraction, *Pollutant identification, Industrial wastes, Mineral industry, Solid wastes, Analytical techniques, Lakes.
Identifiers: *Asbestiform amphibole fibers, Taconite tailings.

Electron microscopic and X-ray diffraction analyses of asbestiform amphibole fibers in Lake

Superior water are reported. The lake, which is used for municipal water supplies, contains large concentrations of asbestiform minerals as a result of a taconite tailings discharge at Silver Bay, Minnesota. Daily X-ray diffraction studies and occasional transmission electron microscope measurements of Duluth, Minnesota drinking water samples revealed amphibole fiber counts per liter of water ranging from 10-1000 million, with the average being 45-100 million. Not all of the amphibole fibers present can be identified due to their extremely small width. Large fluctuations in fiber concentrations are attributable to seasonal and meteorological changes which influence Western Lake Superior water circulation. Variations in electron microscope amphibole fiber counts generally correspond to variations in amphibole mass concentration determined by X-ray diffraction. (See also W76-10637) (Kreager-FIRL)
W76-11248

AUTOMATED FLUORIDATION USING A SELECTIVE ION ELECTRODE,
Peterborough Utilities Commission, Peterborough, Ontario, Canada, Filtration Plant.
For primary bibliographic entry see Field 5F.
W76-11251

SOURCE IDENTIFICATION OF FUEL OIL SPILLS,
Ontario Ministry of the Environment, Rexdale. Lab. Services Branch.
O. W. Berg, P. L. Diosady, R. L. Gutteridge, A. A. Nicholson, and H. L. Vanesche.
In: Proceedings, Seventeenth Conference on Great Lakes Research, Part 1; McMaster University, Hamilton (Ontario), August 12-14, 1974. International Association for Great Lakes Research, p 483-492, 1974. 10 fig, 5 tab, 13 ref.

Descriptors: *Oil spills, *Water pollution, *Pollutant identification, Oil, Fuels, Pollutants, Analytical techniques, Spectroscopy, Ultraviolet radiation, Gas chromatography, Chemical analysis, Oil pollution, Ships, Water pollution sources, Infrared radiation.
Identifiers: Fluorescence spectrometry.

Ultraviolet, infrared and fluorescence spectrometry and gas chromatography were studied as methods for the passive tagging of furnace fuel oil spills. It was found that only gas chromatography, using a sulphur sensitive flame photometric detector, was capable of distinguishing between different brands of furnace oil which had been weathered for more than twenty four hours. (See also W76-11275) (Sims-ISWS)
W76-11314

BACTERIA AND PHOSPHORUS AS INDICATORS OF THE EXTENT OF A LARGE SEWAGE SPILL IN LAKE ERIE,
Canada Centre for Inland Waters, Burlington (Ontario).
N. M. Burns, H. R. van Otterloo, and B. J. Dutka.
In: Proceedings, Seventeenth Conference on Great Lakes Research, Part 1; McMaster University, Hamilton (Ontario), August 12-14, 1974. International Association for Great Lakes Research, p 493-500, 1974. 4 fig, 4 tab, 9 ref.

Descriptors: *Sewage, *Sewage bacteria, *Phosphorus, *Lake Erie, Bacteria, Coliforms, Streptococcus, Dissolved oxygen, Sewage effluents, Wastes, Pollutants, Water pollution, Water pollution effects, Path of pollutants, Lakes, Epilimnion, Hypolimnion, Surveys, Limnology.
Identifiers: *Sewage spills.

On June 21, 1971, a sewage treatment plant in Cleveland, Ohio, broke down and discharged 19,000 cu m/hr of raw sewage for approximately ten days. Immediately after the spill ceased, water samples from the epilimnion and hypolimnion were collected from the surrounding U.S.A. waters and across the international boundary. These samples were analyzed for coliforms, fecal coliforms, fecal streptococci, dissolved oxygen, particulate organic carbon, and total filtered and total unfiltered phosphorus. From the collected data, and comparisons with earlier Lake Erie data, it was found that only coliforms and phosphorus values were affected by the discharge at the time of the study with coliforms providing the only clear indication of the extent of the spill. Coliform data indicated that the sewage discharge affected bacterial populations up to and across the international boundary line. The failure of phosphorus values to detect the extent of the spill and the use of coliform bacteria to define the boundaries of the plumes were discussed. (See also W76-11275) (Sims-ISWS)
W76-11315

THE EFFECT OF A FOSSIL FUEL POWER PLANT'S COOLING WATER SYSTEM ON THE WATER QUALITY OF GREEN BAY, WISCONSIN,
Wisconsin Univ., Green Bay. Coll. of Environmental Sciences.
For primary bibliographic entry see Field 5B.
W76-11319

A LIMNOLOGICAL SURVEY OF NEARSHORE WATERS OF LAKE SUPERIOR,
Ontario Ministry of the Environment, Toronto. Water Resources Branch.
For primary bibliographic entry see Field 2H.
W76-11321

AN INVESTIGATION OF THREE METHODS FOR THE DETERMINATION OF SUBMICROMOLAR ION CONCENTRATIONS IN WATER,
Wisconsin Univ., Madison. Dept. of Chemistry.
W. J. Blaedel, G. W. Schieffer, R. A. Niemann, and D. E. Dinwiddie.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-256 579, $4.50 in paper copy, $3.00 in microfiche. Wisconsin Water Resources Center, Madison Technical Report WFS WRC 76-01, June 1976. 44 p, 1 tab, 23 fig, 32 ref. OWRT A-053-WIS(5) 14-31-0001-4050 14-31-0001-5050.

Descriptors: *Pollutant identification, Methodology, Sampling, *Ion exchange, *Copper, *Electrodes, *Speciation, Trace elements, Analytical techniques, Water analysis.
Identifiers: *Trace metal ions, *Ion-selective electrodes, *Copper ions, Tubular electrodes, Anodic stripping voltammetry.

Two methods were studied for the sampling, concentration, or determination of trace metal ions at submicromolar levels. 1. Trace ions in a sample donor solution are concentrated by loading upon a pellicular ion exchanger, and these are eluted or stripped into an acceptor solution at an enhanced concentration level so that they can be more easily measured. In studies with Cu(II), enhancements up to 64-fold have been obtained that are in accord with the theoretical Donnan enchancement. Times required are reasonable, being about a half hour for the loading step and about five minutes for the stripping step. Equipment and procedure are being designed to permit estimations of copper ion concentration or activity (speciation) in the field. 2. With sample solution flowing through two tubular electrodes in series, trace metal ions may be deposited cathodically at the upstream electrode, and then stripped off by scanning the upstream electrode toward anodic potentials. With the proper control of conditions, and with the downstream electrode maintained at a constant cathodic potential, collector currents due to metal ions stripped from the upstream electrode can be measured at the downstream electrodes and used for estimating the trace metal ion concentration in the original sample solution. Although the collector currents are smaller than the stripping currents they are observed against a very low and steady background current, in contrast to the high and varying background charging currents observed at the stripping electrode. An expression for the dependence of stripping and collector currents upon deposition time, solution flow rate, etc. has been derived and tested.
W76-11331

IDENTIFICATION OF STABLE ORGANIC COMPOUNDS IN WASTE EFFLUENT,
Connecticut Univ., Storrs. Inst. of Water Resources.
R. P. Collins.
Available from the National Technical Information Service Springfield Va 22161, as PB-256 562, $3.50 in paper copy, $3.00 in microfiche. Completion Report June 1976. 11 p, 4 tab, 2 fig. OWRT A-053-CONN(1), 14-31-0001-3807.

Descriptors: *Organic compounds, *Chlorination, Wastewater treatment, Gas chromatography, Mass spectrometry, Analytical techniques, *Pollutant identification, Organic wastes, Effluents, Infrared radiation, Chemical wastes, Phenols, Sludge, *Industrial wastes.
Identifiers: *Purifax process, *Infrared spectrometry, Textile industry wastes.

Laboratory investigations to identify the refractory organic chemicals released in the wastewater of local textile plants and to determine the fate of these compounds after the wastewater treatment process were carried out. Effluents and sludge from a Purifax Water Treatment Plant were analyzed by gas chromatography infrared and mass spectrometry. Chemical reagents, including ortho phenylphenol, para phenylphenol, biphenyl and methyl salicylate, which are utilized by the textile industries using the Purifax facility were subjected to chlorination and analyzed. Over one hundred compounds were detected by gas chromatography in effluent and sludge obtained from the Purifax plant. Many of the compounds utilized in the textile industry readily chlorinated and could be detected in both the effluent and sludge obtained from the treatment plant. (de Lara-Connecticut)
W76-11338

SOURCES OF WATER QUALITY, LAKE LEVEL, ICE, WATER TEMPERATURE, AND METEOROLOGICAL DATA FOR THE ST. LAWRENCE GREAT LAKES,
Wisconsin Univ., Milwaukee. Center for Great Lakes Studies.
For primary bibliographic entry see Field 7C.
W76-11363

STREAM SEDIMENT COMPOSITION: AN AID TO WATER QUALITY ASSESSMENT,
Imperial Coll. of Science and Technology, London (England). Applied Geochemistry Research Group.
S. R. Aston, I. Thornton, J. S. Webb, J. B. Purves, and B. L. Milford.
Water Air Soil Pollut. 3(3), p 321-325, 1974.

Descriptors: *Sediments, Water quality, *Trace elements, Mine wastes, Mining, Geochemistry, *Pollutant identification, Maps.

The trace element composition of stream sediments from catchments contaminated by past and present mining activities was used to indicate the trace element status of associated waters. The possibility of using geochemical reconnaissance maps based on the analysis of stream sediments as an ancillary aid to water quality evaluation is discussed.--Copyright 1975, Biological Abstracts, Inc.
W76-11367

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DETERMINATION OF ALUMINUM UNDER PAPERMAKING CONDITIONS,
Papiripari Vallalat Kutato- es Fejlesztointezete, Budapest (Hungary).
J. Papp.
Svensk Papperstidning, Vol. 79, No. 9, p 286-291, May 30, 1976. 11 fig, 23 ref.

Descriptors: *Pulp and paper industry, *Aluminum, *Water analysis, Potentiometers, Electrochemistry, Electrodes, Fluorides, Ions, Wastes, Industrial wastes, Water pollution sources, Trace elements, Effluents, *Pollutant identification.
Identifiers: *White water(Paper machines), Aluminum sulfate, Rosin size.

A fluoride-selective electrode method for the direct potentiometric analysis of aluminum in paper mill effluents is described. It is simple and rapid and suited for the analysis of alum-containing white waters, provided all solids have been filtered off. In its present form, the method cannot be used to determine total aluminum introduced into systems containing pulp plus rosin size, since part of the aluminum in the pulp and in precipitates is not accessible to reaction with fluoride ions. (Brown-IPC)
W76-11386

DETERMINATION OF LIGNIN IN EFFLUENTS (OPREDELENIE LIGNINA V STOCHNYKH VODAKH),
Vsesoyuznyi Nauchnyi Planovii Otdel Bumazhnoi Promyshlennost, Moscow (USSR).
A. A. Sokolova, D. P. Moseeva, and L. A. Semakova.
Bumazhnaya Promyshlennost, No. 2, p 23-24, February, 1976. 2 tab.

Descriptors: *Lignins, *Pulp wastes, *Spectrophotometry, Analytical techniques, Water pollution sources, Ultraviolet radiation, Chemical precipitation, Filtration, Drying, Separation techniques, Effluents, Wastes, Industrial wastes, *Pollutant identification.
Identifiers: *Black liquors, Rosin acids, Wood extractives.

The presence of extractives (mainly rosin acids) in kraft black liquor introduces a considerable error into the determination of lignin by ultraviolet absorption spectrophotometry (at 280 nm), because the extractives absorb at the same frequency. The lignin content determined may be as much as 25% higher than the actual content. A modified formula is presented for calculating the lignin content from spectrophotometric data which takes into account the concentration and the specific absorption of the extractives. The concentration of the extractives is determined in a black liquor sample by precipitating lignin with HCl, separating it by filtration, drying, and extracting with petroleum ether in a Soxhlet apparatus. The solvent is evaporated, the residue dried and weighed and the concentration of extractives calculated. The specific absorption of the extractives is determined spectrophotometrically in ethanol solution. (Stapinski-IPC)
W76-11387

PHOTOMETRIC METHOD FOR THE CONTROL OF SUSPENDED SOLIDS IN SEDIMENTATION TANKS (FOTOMETRICHESKII METOD KONTROLYA VZVESHENNYKH VESHCHESTV V OTSTOINIKAKH),
Vsesoyuznyi Nauchnyi Planovyi Otdel Bumazhnoi Promyshlennost, Moscow (USSR).
S. S. Simonov, Yu. D. Miromanov, and I. A. Evstigneev.
Bumazhnaya Promyshlennost, No. 2, p 24, February, 1976. 1 fig.

Descriptors: *Suspended solids, *Pulp wastes, Instrumentation, Settling basins, *Photometry, Equipment, Water pollution sources, Foreign countries, Pulp and paper industry, Monitoring, Effluents, *Settling tanks, Sedimentation
Identifiers: USSR, Clarifiers, Savealls, Process control

The apparatus described, which was developed at the All Union Research Institute of the Pulp and Paper Industry (USSR), allows not only controlling the operation of a sedimentation tank by sample analysis, but also obtaining full information on the distribution of suspended solids directly in the operating tank within a short time (1.5-2 hr). In the apparatus (a diagram of which is given), a resistance box is included in the circuit of a photoresistor, and the reduction in voltage is measured by a recording potentiometer. The photoelectric sensor, which is immersed in the liquid, consists of a turbidity meter and an automatic indicator of the sediment level. The photometric method of determining the distribution of suspended solids can also be used in clarifiers with a suspended sediment layer, in savealls, etc. (Stapinski-IPC)
W76-11390

ON-SITE BIOASSAY TESTING AT CARIBOO PULP AND PAPER,
Cariboo Pulp and Paper Co., Quesnel (British Columbia).
For primary bibliographic entry see Field 5C.
W76-11394

SIMPLIFIED KJELDAHL NITROGEN DETERMINATION FOR SEAWATER BY A SEMIAUTOMATED PERSULFATE DIGESTION METHOD,
Suffolk County Dept. of Environmental Control, Hauppauge, N.Y.
J. M. Adamski.
Analytical Chemistry, Vol. 48, No. 8, p 1194-1197, July, 1976. 2 fig, 7 ref, 5 tab.

Descriptors: *Nitrogen, *Sea water, *Water analysis, Analytical techniques, Trace elements, Water chemistry, Colorimetry, Chemical analysis, Phenols, Ammonia, Pollutant identification.
Identifiers: *Kjeldahl nitrogen, Potassium persulfate.

Persulfate digestion in combination with indophenol colorimetry via a Technicon AutoAnalyzer II was used as an alternative to the standard Kjeldahl nitrogen method as specified in 'Standard Methods for the Examination of Water and Wastewater' (American Public Health Association). Application of this method to the analysis of seawater samples demonstrated that a large quantity of samples can be rapidly processed with relative ease in a small environmental laboratory. A detection limit of 0.06 mg/liter as nitrogen was calculated for the operating range 0-5.6 mg/liter. Seawater samples spiked with 3.00 mg/liter of ammonia nitrogen were analyzed with a precision of 0.25 mg/liter and a spike recovery of 105+6.8%. Seawater samples spiked with 3.35 mg/liter of Kjeldahl nitrogen contained in a raw domestic waste were analyzed with a precision of +0.30 mg/liter and a spike recovery of 100+8.1%. The persulfate method simplifies the determination of Kjeldahl nitrogen in seawater while successfully maintaining low level requirements for sensitivity, precision, and accuracy. (Witt-IPC)
W76-11396

MICROGRAM DETERMINATION OF BORON IN SURFACE WATERS BY ATOMIC EMISSION SPECTROMETRY,
Utah State Div. of Health, Salt Lake City. Bureau of Labs.
F. D. Pierce, and H. R. Brown.
Analytical Chemistry, Vol. 48, No. 4, p 670-673, April, 1976. 2 fig, 8 ref, 3 tab.

Descriptors: *Water analysis, *Boron, *Surface waters, *Spectroscopy, Analytical techniques, Water pollution sources, Trace elements, Water chemistry, Water properties, Water quality, *Pollutant identification, *Spectrophotometry
Identifiers: *Atomic emission spectrometry

A description is given of an automated method for the analysis of boron in surface water specimens by atomic emission spectrometry. The technique employs a nonmechanical concentration step, an automated boron concentration by methanol distillation, and an automated aspiration-analysis procedure. Sixty specimens can be distilled and 180 distilled specimens can be analyzed per hour. The detection limit and the sensitivity provided by the technique are 0.002 mg/liter and 0.004 mg/liter, respectuvekt. (Witt-IPC)
W76-11397

DETERMINATION OF URANIUM IN NATURAL WATERS BY NEUTRON ACTIVATION ANALYSIS,
Los Alamos Scientific Lab., Los Alamos, N. Mex.
F. S. Gladney, J. W. Owens, and J. W. Starner
Analytical Chemistry, Vol. 47, No. 7, p 973-975, June, 1976. 13 ref, 3 tab.

Descriptors: *Water analysis, *Uranium radioisotopes, *Natural streams, Analytical techniques, *Neutron activation analysis, Anion exchange, Alaska, New Mexico, Water pollution sources, Radioisotopes, Trace elements, Water chemistry, *Pollutant identification.

A rapid procedure has been developed for the measurement of uranium in natural waters using thermal neutron activation and anion exchange separation of radio-uranium from ethanol/HCl solvent mixtures. Detection limits of 0.05 ppb have been achieved with analytical precisions of +10-30%. Results of uranium analyses by this procedure and by fluorometry are compared for natural water samples from Alaska and New Mexico. (Witt-IPC)
W76-11398

HYDROLOGIC DATA FOR URBAN STUDIES IN THE SAN ANTONIO, TEXAS METROPOLITAN AREA, 1974,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 7C.
W76-11413

HYDROLOGIC RECORDS FOR LAKE COUNTY, FLORIDA, 1973-74,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 7C.
W76-11414

GROUND-WATER FLOW AND POLLUTION AT A WELL FIELD, OLEAN, NEW YORK,
Geological Survey, Albany, N. Y.
For primary bibliographic entry see Field 5B.
W76-11417

ANALYSIS OF SELECTED BENTHIC COMMUNITIES IN THE FLORIDA EVERGLADES WITH REFERENCE TO THEIR PHYSICAL AND CHEMICAL ENVIRONMENT,
Geological Survey, Tallahassee, Fla.
B. G. Waller.
Available from the National Technical Information Service, Springfield, Va 22161, as ADA-25593, $4.00 in paper copy, $3.00 in microfiche. Water-Resources Investigations 76-28, April 1976. 33 p, 6 fig, 7 tab, 21 ref.

Descriptors: *Water quality, *Marshes, *Canals, *Florida, *Benthos, Invertebrates, Water analysis, Environmental effects, Flow rates, Discharge(Water), Agricultural runoff, Sewage effluents, Data collections, Water pollution sources.
Identifiers: *Everglades(Fla).

pecies diversity and numbers of benthic macroin-ertebrates were determined at 12 sites, both anals and marshes, in the Everglades of south lorida. The values calculated are used to indicate ng-term trends in water quality and variations etween study areas. Species diversity at all sites as generally in a range indicative of degraded ater quality. The number of organisms per quare meter of bottom surface was highly varia-le ranging from 43 to 8,200 organisms. Chemical nalysis of water and bottom material indicated no ross contamination from sewage or agricultural noff in any of the canals where benthic organ-ms were collected. Other physical factors such s depth, velocity of flow, substrate type, and ater-level fluctuation were responsible for the w species diversities and variable numbers of or-anisms, rather than contamination from urban or gricultural areas. (Woodard-USGS)
76-11418

HE NATIONAL STREAM QUALITY AC-OUNTING NETWORK,
eological Survey, Reston, Va.
S. Cragwall, Jr.
he Military Engineer, Vol 68, No 441, p 25-27, nuary-February 1976. 2 fig, 2 tab.

escriptors: *Water quality, *Data collections, Monitoring, *Networks, *United States, Re-onal analysis, Hydrologic data, Planning, Net-ork design, Surface waters, Groundwater, Pollu-nt identification.
dentifiers: NASQAN.

he U. S. Geological Survey (USGS) has tablished the National Stream Quality Account-g Network (NASQAN) to make continuous mea-rements needed to assess national and regional ater quality. NASQAN, which is based on a drologic subdivision of the United States, esently includes 345 stations, and is designed to clude 525 stations when completed. Data are col-cted on a wide-range of physical, chemical, and ological characteristics. Samples are processed rough the USGS Central Laboratory System, a oup of large laboratories which have been tablished to take advantage of efficient and sen-ive, but expensive instruments. NASQAN will ovide an assessment of water quality on national d regional scales, but a host of other programs e needed to provide all the information required manage water quality. (Woodard-USGS)
76-11419

ETTABILITY OF HUMIC ACID AND ITS LTS,
r primary bibliographic entry see Field 2K.
76-11421

PRELIMINARY STUDY ON THE OCCUR-NCE AND DISTRIBUTION OF GEOFUNGI LAKE ONTARIO NEAR THE NIAGARA VER,
nada Centre for Inland Waters, Burlington ntario).
r primary bibliographic entry see Field 2H.
76-11427

CTERIAL POPULATIONS IN LOWER EEN BAY,
sconsin Univ. Green Bay, Coll. of Environmen-Sciences.
r primary bibliographic entry see Field 2H.
6-11428

/GL CHEMICAL INTERCOMPARISONS,
tional Oceanic and Atmospheric Administra-n, Ann Arbor, Mich. Great Lakes Environmen-Research Lab.
primary bibliographic entry see Field 2H.
6-11430

PARTICULATE RESIDENCE TIMES,
Atmospheric Environment Service, Toronto (Ontario).
D. M. Whelpdale.
Water Air Soil Pollut. 3(3), p 293-300, 1974.

Descriptors: *Air pollution, *Canada, *Great Lakes, Lakes, Mathematical models, Pollutant identification, Path of pollutants, Water pollution.
Identifiers: *Lake St. Clair, *Air particulate deposition(Lakes).

Examination of suspended particulate concentration data from a 1 yr-long, regional air-quality study of a portion of the Great Lakes (Canada) area revealed that depletion of particulates occurred during extended periods of travel over water surfaces. Based on particulate concentrations and meteorological measurements, residence times of background regional particulate matter were between 5-16 h in the region. Using a simple model for the deposition of particulate matter into the lakes, deposition rates ranging from 0.2-3.9 micro-g m-2 s-1 were found. This results in an estimated 150 metric tons of material being deposited into Lake St. Clair, area 1270 km2, during a 24 h period.--Copyright 1975, Biological Abstracts, Inc.
W76-11450

AN INTEGRATED STUDY ON THE IMPACT OF METALLIC TRACE ELEMENT POLLUTION IN THE COEUR D'ALENE-SPOKANE RIVERS-LAKE DRAINAGE SYSTEM,
Washington State Univ., Pullman. Dept. of Sanitary Engineering.
For primary bibliographic entry see Field 5C.
W76-11488

WATER QUALITY OF STREAMFLOW FROM PONDEROSA PINE FOREST WATERSHEDS ON SEDIMENTARY SOILS,
Arizona Univ., Tucson. School of Renewable Natural Resources.
P. F. Ffolliott.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-256 760 $3.50 in paper copy, $3.00 in microfiche. Completion Report, August 1976. 4 p, 1 tab, 2 ref. OWRT A-066-ARIZ(2), 14-34-0001-6003.

Descriptors: *Water quality, Watershed management, Land use, Water analysis, *Ponderosa Pine tree, *Arizona, *Pollutant identification, *Forest watershed, Correlation analysis, Salts, Surface runoff, Streamflow, Water sampling.
Identifiers: *Sedimentary soils.

Water samples were collected weekly and at times of unusual hydrological events from 4 ponderosa pine watersheds on sedimentary soil to; (1) examine the chemical, physical, and bacteriological characteristics (2) explore the empirical association of these water quality parameters with land use patterns, and (3) analyze the interactions among these parameters. In each sample, calcium, magnesium, and sodium were measured using atomic absorption spectrophotometry; carbonate and bicarbonate were measured by titrating with standard acid; and fluoride, sulfate, nitrate, phosphate (in a limited number of samples), and chloride amounts were determined by colorimetric methods using an Autoanalyzer. Hydrogen ion concentrations were measured using a glass electrode; suspended sediment concentrations were determined by filtration; and the presence of fecal coliform was determined using the membrane filter technique. Statistical analyses indicated no significant difference between water quality parameters among the four watersheds. Correlation analysis revealed that pH was inversely related to sodium, chloride, nitrate, and bicarbonate, and positively associated with calcium. Streamflow discharge was positively related to fluoride and nitrate, and negatively correlated to sodium and total soluble salts. While conductivity and total soluble salts were positively associated, no associations existed between concentrations of individual chemical constituents and suspended sediment, nor between concentrations of suspended sediment and streamflow discharge. No fecal coliform was found in the samples tested. (Hasbrouck-Arizona)
W76-11490

NON-POINT SOURCE WATER QUALITY MONITORING, INYO NATIONAL FOREST, 1975,
California University, Los Angeles, Environmental Science and Engineering.
Available from the National Technical Information Service Springfield, Va. 22161 as PB-256 713 $5.50 in paper copy, $3.00 in microfiche. Progress Report, Contribution No. 156 California Water Resources Center, Davis, March 1976. 138 p, 67 fig, append. Edited by J. Baas, F. D. Westerdahl, and R. L. Perrine. (California Water Resources Center Project UCAL-WRC-W-489).

Descriptors: *Water quality, *Monitoring, Environmental effect, *Recreation wastes, National parks, *California, Water pollution sources, *Sampling, Tests, Testing procedures, *Pollutant identification.
Identifiers: *Inyo National Forest(Calif).

Results are presented of a study on the impact of non-point sources on water quality in wilderness and recreational areas within the Inyo National Forest. One objective was to assess water quality with regard to physical, chemical and bacteriological parameters in a manner evaluation of area-wide sources. A second objective was to develop improved test methods for continuing water quality monitoring and protection in such areas. A monitoring program was conducted, in which 34 sites, selected by the U. S. Forest Service, were sampled one or more times during the summer and fall of 1975. Most sites can be characterized as high altitude, alpine lakes of small to moderate size or streams, snow-fed from granite basins. All sites represent areas frequented by recreational visitors, and were sampled with their use as a primary concern. Physical measurements included air and water temperature, dissolved oxygen, pH and total dissolved solids. Chemical analyses included tests for sulfates, nitrate-nitrogen, Kjeldahl nitrogen, chloride, phosphates, total phosphorus and methylene blue active substances. Bacteriological observations included total and fecal coliform organism and Yersinia enterocolitica. Additional sampling concerned algae in a portion of the lakes studied. A separate research effort by means of laboratory-scale experimental investigation looked into the means of transport of bacteria from sites at which they might be deposited to a nearby water body. (Snyder-California, Davis)
W76-11492

BACTERIAL AND COLIFORM COUNTS IN THE WATER SUPPLY OF SLAUGHTER HOUSES SITUATED IN THE VICINITY OF SALVADOR-BAHIA: BRIEF NOTE, (IN PORTUGUESE),
Universidade Federal da Bahia, Salvador (Brazil).
Edred Novaes Teixeira, and Carlos Adan Cordeiro.
Bol Inst Biol Bahia. 12(1), p 102, 1973.

Descriptors: Water supply, *Bacteria, *Coliforms, Industrial wastes, *Pollutant identification, *Industrial water, South America.
Identifiers: *Brazil(Salvador-Bahia), Slaughter house wastes.

Good quality water must be used in food processing to avoid contamination of the finished products. In order to evaluate the quality of the water being used in slaughter houses around Salvador-Bahia, Brazil, bacteriological testing was conducted. Of 22 water samples analyzed, 19 revealed total viable bacterial counts of greater than 500 colonies/ml. Presumptive coliform counts

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ranged from 0-9.2 organisms/ml of water.--Copyright 1975, Biological Abstracts, Inc.
W76-11525

METHOD OF DETERMINING RESIDUES OF THE HERBICIDE LENACIL IN WATER, SOIL AND SUGAR BEETS, (IN RUSIAN),
Lab. Toxicol., All-Russ. Res. Inst. Plant Prot., Ramon, USSR. Vserossiiskii Nauchno-Issledovatelskii Institut Zashchity Rastenii, Ramon (USSR). Lab. of Toxicology.
V. S. Shustrov, and D. A. Shvets.
Vopr Pitan. 2, p 85-86, 1974.

Descriptors: *Pollutant identification, *Herbicides, *Pesticide residues, *Solvent extractions, *Chromatography, Water analysis, Soils, Sugar beets, Distillation.
Identifiers: Chloroform extraction, *Lenacil, Thin layer chromatography.

The chemically pure herbicide, lenacil, is a colorless, odorless crystalline powder containing 80% of the active principle 3-cyclohexyl-5,6-trimethylene uracil. The method developed for determining residues of lenacil in water, soil and sugar beets is based on extraction of the herbicide from the investigated sample with chloroform, distillation of the solvent and TLC. The sensitivity of the method is 5-10 micro g of lenacil in the sample.--Copyright 1975, Biological Abstracts, Inc.
W76-11527

STUDY OF WATER SORPTION ON BIOPOLYMERS, (IN RUSSIAN).
Politekhnicheskii Institut, Leningrad (USSR).c
For primary bibliographic entry see Field 2K.
W76-11532

BACTERIOCOENOTIC STUDIES ON A WEAKLY DYSTROPHIC STREAM, (IN GERMAN),
For primary bibliographic entry see Field 5C.
W76-11533

BACTERIOCOENOTIC STUDIES ON AN OLIGOTROPHIC STREAM, (IN GERMAN),
For primary bibliographic entry see Field 5C.
W76-11534

BACTERIOCOENOSE STUDIES ON AN EUTROPHIC BIOTOPE, (IN GERMAN),
For primary bibliographic entry see Field 5C.
W76-11535

THE STATISTICAL APPROACH TO THE STUDY OF THE SMALL RIVERS HYDROCHEMICAL REGIME IN WESTERN POLESYE OF THE UKRAINIAN SSR, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Instytut Hydrobiologii.
I. V. Grib, and B. I. Nabivanets.
Gidrobiol Zh. 10(2), p 11-21, 1974.

Descriptors: *Statistical studies, Rivers, Water chemistry, Estimating, Dissolved oxygen, Biochemical oxygen demand, *Carbonates, *Calcium, *Chlorides, Ions, *Mineralogy, *Pollutant identification.
Identifiers: Polesye, *Ukrainian-SSR, USSR.

A statistical analysis was performed for long-term data on the hydrochemical regime of small rivers in western Polesye of the Ukraine (USSR). The processing involved the following hydrochemical estimates: BPK5 (biochemical O2 demand for 5 days), dissolved O2, permanganate oxidability NH3-N, chlorides, Ca, Mg, hydrocarbonates and mineralization. Equations showing the relation of these estimates to water out-flow rates were formulated and respective correlation coefficients calculated. The natural background is assumed as a basis for deducing mineralization equations expressed through the HCO3-, Ca2+ and Cl- contents.--Copyright 1975, Biological Abstracts, Inc.
W76-11536

BACTERIAL POPULATIONS IN SKADAR LAKE, (IN SERBO-CROATIAN),
Zavod Za Biologiju Mora, Kotor (Yugoslavia).
For primary bibliographic entry see Field 5C.
W76-11538

THE EFFECT OF PREPARATION ON THE MERCURY CONTENT OF FISH AND MUSHROOMS, (IN GERMAN),
Bundesforschungsanstalt fuer Lebensmittelfrischhaltung, Karlsruhe (West Germany). Institut fuer Strahlen-technologie.
R. Schelenz, and J. F. Diehl.
Lebensm-Wiss + Technol. 8(2), p 85-86, 1975.

Descriptors: *Mercury, Fish, Pollutant identification.
Identifiers: *Agaricus-Spp, *Leuciscus-Rutilus, Mushrooms, *Fish preparation(Cooking).

Leuciscus rutilus (4) were filleted and steamed for 20 min. and fried for 10 min. Two Agaricus spp. were washed, halved and stewed in their own juices for 20 min. Hg content decreased very slightly in the fish after steaming and frying. The cooking residue left after the steaming of the fish contained 0.04-0.10 micro-g Hg. The residue of the mushrooms contained 0.07-0.21 micro-g.--Copyright 1975, Biological Abstracts, Inc.
W76-11546

QUANTITATIVE CHARACTERISTICS OF DISTRIBUTION OF BDELLOVIBRIO BACTERIOVORUS IN RIVER WATER, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Inst. of Biochemistry and Physiology of Microorganisms.
V. A. Lambina, N. A. Chuvil'skaya, L. A. Ledova, A. V. Afonigenova, and I. V. Averburg.
Mikrobiologiya. 43(4), p 715-720, 1974.

Descriptors: *Bacteria, *Viruses, Distribution, Pollutant identification, E coli, Bioindicators, Microorganisms, Rivers, Parasites, Water pollution, Water purification, Self purification.
Identifiers: *Bdellovibrio-Bacteriovorus, *USSR(Okra River).

Quantitative characteristics of the distribution of B. bacteriovorus were studied in the water of the Okra river (USSR), namely, the ratio between this bacterial parasite and the total content of microorganisms in the water as well as the concentration of Escherichia coli, one of its most widely distributed hosts. The distribution of Bdellovibrio can be a criterion for water contamination. Bdellovibrio is probably one of the active factors participating in water self-purification.--Copyright 1975, Biological Abstracts, Inc.
W76-11551

THE DETERMINATION OF PHENOLS IN WATER: GAS CHROMATOGRAPHIC IDENTIFICATION BY MEANS OF THE ELECTRON AFFINITY, (IN GERMAN),
Mainz Univ. (West Germany). Hygiene Institut.
H. Kunte.
Zentralbl Bakteriol Parasitenkd Infektionskr Hyg Erste Abt Orig Reihe B Hyg Praev Med. 160(2), p 148-154, 1975.

Descriptors: *Pollutant identification, *Phenols, *Gas chromatography, Organic compounds, Analytical techniques.
Identifiers: *Electron affinity(Phenols), Electron capture detector, Flame ionization detector.

The electron affinities for 98 phenolic compounds were determined using an electron capture detector (ECD) and a flame ionization detector (FID). The signals of the 2 detectors were registered simultaneously on a 2 channel recorder by splitting the gas stream at the column outlet for the ECD and the FID (1 1). The peak areas were corrected for equal concentration and instrument parameters and the ratio of peak area (ECD) to peak area (FID) was used as a measure of electron affinity. Among the phenolics found in water there are several groups with high or very high electron affinity, e g , dichlorophenols, trichlorophenols, tetra- and pentachlorophenol; the values of these compounds are about 100, 1000, 10000, and 30000 times higher, respectively, than that of phenol itself and its alkyl derivatives. For the mono- and dinitrophenols the corresponding figures are between 100 (o-nitrophenol) and 5000 (dinitrophenols). A comparatively high value was found for salicyclic aldehyde: about 250 compared with phenol. The application of these values in the identification of some peaks in the gas chromatogram of a river water extract is demonstrated.--Copyright 1975, Biological Abstracts, Inc.
W76-11552

EFFECT OF THE DEGREE OF VACUUM USED IN FILTRATION ON THE SIMULTANEOUS MEASUREMENT OF ASSIMILATION AND EXCRETION BY PHYTOPLANKTON ORGANISMS, (IN FRENCH),
Office de la Recherche Scientifique et Technique Outre-Mer, Abidjan (Ivory Coast). Centre de Recherches Oceanographiques.
For primary bibliographic entry see Field 5C.
W76-11554

PRIMARY PRODUCTION IN THE MAURITANIAN UPWELLING IN MARCH 1973, (IN FRENCH),
Office de la Recherche Scientifique et Technique Outre-Mer, Abidjan (Ivory Coast). Centre de Recherches Oceanographiques.
For primary bibliographic entry see Field 5C.
W76-11555

RADIOACTIVITY IN THE MEDITERRANEAN SEA, (IN ITALIAN),
Parma Univ. (Italy). Instituto di Zoologia.
L. T. Pelati, C. Triulzi, and M. G. Mezzadri.
Ateneo Parmense Acta Nat. 11(1), p 171-180, 1975.

Descriptors: *Radioactivity, *Radioisotopes, Sediments, Plankton, Fallout, Strontium radioistopes, Water pollution.
Identifiers: *Cesium-137, *Mediterranean Sea, *Strontium-90.

Some important artificial radionuclides in plankton, water and sediment samples collected in various areas of the Mediterranean Sea were analyzed. Some considerations are drawn on the differences found among Italian seas. The evolution of 137Cs/90Sr ratio from fallout to marine sediments is examined.--Copyright 1976, Biological Abstracts, Inc.
W76-11558

RAPID DETERMINATION OF NO3 IN WATER, (IN ROMANIAN),
Institutul Agronomic, Bucharest (Rumania).
T. Galben, and V. Bucurenciu.
Lucr Stiint Inst Agron Nicolae Balcescu Bucur Ser B. 15, p 415-420, 1972.

Descriptors: *Pollutant identification, *Nitrates, Water analysis, *Colorimetry, Soil analysis.

A simple and rapid method for determining NO3 in water and soil saline extracts was devised. The suggested colorimetric method is based on the oxidation of O-tolidine by water nitrates in a concentrated H2SO4 medium and the formation of yellow

compounds.--Copyright 1976, Biological Abstracts, Inc.
W76-11559

DECREASE OF STRONTIUM-90 CONTENT IN THE TUNDRA SOIL-VEGETATION COVER, (IN RUSSIAN),
Ural Science Center, Sverdlovsk (USSR). Inst. of Plant and Animal Ecology.
For primary bibliographic entry see Field 2K.
W76-11565

STUDY OF THE BEHAVIOUR OF POLIOMYELITIS VIRUS TYPE 1 IN DIFFERENT HYDROUS MEDIA, (IN FRENCH),
Metz Univ. (France).
J. Schwartzbrod, P. Dixneuf, L. Schwartzbrod, J. C. Brochet, and J. M. Foliguet.
Rev Epidemiol Med Soc Sante Publique 23(4/5), p 235-252, 1975.

Descriptors: *Bacteria, *Viruses, *Humus, Water pollution, Water analysis, Organic matter, Statistical studies, Volumetric analysis, Pollutant identification.
Identifiers: Pecornavirus, *Poliovirus, Hydrous media.

Several surveys on natural inactivation of viruses in water were analyzed. The survival life of poliomyelitis virus type 1 was studied in hydrous medium of known composition, well-buffered and devoid of any bacterial contamination, in a similar medium with organic humate-type substances added. The experiment was done at 4C and at room temperature (18-24C). The presence of humate-type substances apparently has no significant influence on the development of poliomyelitis virus type 1. The survival time of the virus in the experiment was an average of 296 days for a storage temperature of 18-24C (much longer than previously described). It was longer in water kept at 4C. Statistical calculations and titrations performed for 550 days indicated that the total disappearance of the virus occurs only after 10-15 yr.--Copyright 1976, Biological Abstracts, Inc.
W76-11569

THE APPLICATION OF 'BIOTIC INDICES' TO THE STUDY OF POLLUTION IN A RIVER WITH CYPRINIDAE, (IN FRENCH),
Station Bioligique des Eyzies (France).
G. Moreau, J. Couffignal, J.-P. Dubreuil, J.-M. Fauconnier, and J. Lancon.
Ann Limnol. 8(1): 71-85. Illus. 1972. (Engl. Ger. summ.).

Descriptors: *Bioindicators, *Benthos, *Invertebrates, *Hydrobiology, Bioassay, Chemical analysis, Pulp wastes, Water pollution, Rivers.
Identifiers: *Cyprinidae, *France(Vezere River).

A hydrobiological profile of the Vezere (France) was drawn up for the lower reaches, from below Terrasson to below Bugue, by calculating 'biotic indices' based on variations in the populations of benthic invertebrates. The results produced evidence for an important disturbance of the fauna within 2 sectors: the 1st sector was a 25 km stretch immediately downstream from a paper-pulp factory; the 2nd section of about 7 km was situated downstream from the 1st zone and its origin, in the absence of all apparent sources of pollution, was hypothetically attributed to a resurgence of water disappearing just downstream from the factory. Physical-chemical analyses were in agreement with these results and indicated that the pollution is of an organic nature. The advantages of the 2 methods, chemical and biological, as well as a proposal for the improvement of the biotic-index method, were discussed.--Copyright 1975, Biological Abstracts, Inc.
W76-11580

ABSORPTION AND ACCUMULATION OF PESTICIDES RESIDUES AND CHLORINATED BIPHENYLS IN BOTH WILD AQUATIC VEGETATION AND RICE IN THE CAMARGUE REGION, (IN FRENCH),
Centre National de la Recherche Scientifique, Arles (France). Centre Ecologie Camargue.
For primary bibliographic entry see Field 5C.
W76-11582

ECOTOXICOLOGY OF CRUDE OILS AND THE USE OF EXPERIMENTAL MARINE ECOSYSTEMS,
Museum National d'Histoire Naturelle, Paris (France). Laboratoire de Physiologie Generale et Comparee.
For primary bibliographic entry see Field 5C.
W76-11586

IDENTIFICATION OF ORGANIC COMPOUNDS IN EFFLUENTS FROM INDUSTRIAL SOURCES,
Versar, Inc., Springfield, Va. General Technologies Div.
E. F. Abrams, D. Derkics, C. V. Fong, D. K. Guinan, and K. M. Slimak.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-241 641, $7.75 in paper copy, $3.00 in microfiche. Report EPA-560/3-75-002, April, 1975. 172 p, 2 fig, 11 tab, 208 ref, 4 append.

Descriptors: *Waste water treatment, *Pollutant identification, *Biochemical oxygen demand, *Organic compounds, *Water supply, Chemical wastes, Chemical industry, Chemistry, Industrial wastes.

An initial assessment is provided of the possible sources of 154 organic compounds which have been identified in drinking water supplies. Of these, 113 are classified as major pollutants. The most obvious industrial source of organics is the point source discharge of effluents, both treated and untreated. Chlorinating such effluents controls biochemical oxygen demand (BOD) but can create highly unreactive substances. In municipal systems, discharged compounds may become halogenated, be partially or completely degraded, or remain unchanged. Organics emitted as air pollutants may enter surface waters by rainfall. Organic compounds from landfilled solid wastes, sludges, and slurries may leach into groundwater where they may be degraded or interact to produce other organic compounds. Discharges from domestic treatment plants may also be responsible for a variety of chlorinated organics. Chlorination of river water containing organics can produce several halomethanes and haloethanes. Industrial product use, however, appears to be the greatest potential source of organic pollutants, because recovery of product is maximized during manufacture. Sixty-seven of the compounds considered may be formed by various chemical reactions in air, water, or soil. Of the 154 compounds studied, 7 were classified as easily degraded, 17 as degraded without much difficulty, 41 as difficult to degrade, 36 as very difficult to degrade, and 53 as refractory. This distribution is as expected, because less persistant chemicals should be expected to degrade closer to their sources before being detected. (Snyder-FIRL)
W76-11598

AN IMPROVED MODEL FOR ANALYSIS OF AIR AND WATER POLLUTION DATA,
Environmental Protection Agency, Las Vegas, Nev. Office of Research and Development.
For primary bibliographic entry see Field 5B.
W76-11606

DATA MANAGEMENT: KEY TO ENVIRONMENTAL QUALITY ASSESSMENT,
National Oceanic and Atmospheric Administration, Washington, D. C. Environmental Data Service.
For primary bibliographic entry see Field 5G.
W76-11607

A PRACTICAL DATA MANAGEMENT SYSTEM FOR MONITORING AND MANAGING LARGE DISTRIBUTED ECOSYSTEMS,
Michigan State Univ., East Lansing. Dept. of Electrical Engineering and Systems Science.
For primary bibliographic entry see Field 5G.
W76-11608

THE ROLE OF ENVIRONMENTAL DATA BANKS IN ENERGY RESOURCE DEVELOPMENT,
Kentucky Univ., Lexington. Inst. for Mining and Minerals Research.
For primary bibliographic entry see Field 5G.
W76-11609

SAMPLE TRACKING DATA MANAGEMENT SYSTEM,
Environmental Monitoring and Support Lab., Las Vegas, Nev.
For primary bibliographic entry see Field 7C.
W76-11611

QUALITY CONTROL AND HARMONIZATION PROGRAMMES FOR THE ASSESSMENT OF EFFECTS AND THE MEASUREMENT OF ENVIRONMENTAL POLLUTION IN THE EUROPEAN COMMUNITIES,
Commission of the European Communities, Luxembourg. Health Protection Directorate.
For primary bibliographic entry see Field 5G.
W76-11613

VALIDATION OF ENVIRONMENTAL MEASUREMENT METHODOLOGY,
Environmental Monitoring and Support Lab., Cincinnati, Ohio.
J. A. Winter.
In: International Conference on Environmental Sensing and Assessment, Vol. 2, September 14-19, 1975, Las Vegas, Nevada, p 36-5-1 - 36-5-5. 8 fig, 2 tab, 5 ref.

Descriptors: *Quality control, *Water quality, *Analytical techniques, *Evaluation, *Pollutant identification, Measurement, Data processing, *Methodology.
Identifiers: Pyridine-barbituric acid method, Cyanide, Environmental Protection Agency.

The procedure for validating the Environmental Protection Agency's water and waste water data is described. Formal collaborative studies are conducted among federal, state, industrial, laboratories. Samples are prepared in pairs as similar but different concentrates in sealed glass ampuls, and aliquots are added to distilled and natural waste water for subsequent determination by participating laboratories. Differences in the recoveries in these water samples indicate method bias and interferences. Computer programs are used to statistically treat the data and complete the evaluations. The results from these measurements are used to characterize specific analytical methods, to establish precision and accuracy limits for Environmental Protection Agency manuals, and to provide input to formal reports developed by the Agency. Examples of data summaries are provided for the Pyridine-Barbituric Acid Method for total cyanide and cyanide amenable to chlorination in natural waters. (See also W76-10637) (Kreager-FIRL)
W76-11614

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5B. Sources Of Pollution

THE MICROBIAL DEGRADATION OF OIL IN THE SEA,
University Coll., Cardiff (Wales). Dept. of Microbiology.
D. E. Hughes, and P. McKenzie.
Proceedings of the Royal Society of London, Biological Sciences, Vol 189, No 1096, p 275-483, 20 May 1975. 9 fig, 1 tab, 39 ref.

Descriptors: *Continental shelf, *Oil spills, *Oil pollution, *Microbial degradation, *Fossil fuels, Resources development, Environmental effects, Water pollution effects, Water resources, Seepage, Nutrients, Alkanes, Aliphatics, Aromatic compounds.
Identifiers: *Outer Continental Shelf, Offshore technology, Crude oils, Environmental impact.

Oil in the sea, whether from natural seepage or spillage undergoes weathering and loses its lighter fractions so that it sinks: emulsification can also take place. Action to remove spillage includes the use of sinking agents or emulsifiers. From the moment oil is released, microbial infection takes place. This leads to further chemical and physical changes in the oil. Depending on the presence of nutrients (nitrogen, phosphate, oxygen) and other factors such as temperature, oil droplet size etc., microbial growth and consequent oil degradation proceeds. In laboratory experiments and some field studies about 40-90% of the oil may degrade. Alkanes and other saturated compounds are the first to be degraded, aromatic and heterocyclic compounds are the first to be degraded, aromatic and heterocyclic compounds follow; no complete stoichiometric account has yet been made. Sinking agents and dispersants may affect the rate and pattern of degradation. (Sinha-OEIS)
W76-11101

TOXIC HEAVY METALS IN GROUND WATER OF A PORTION OF THE FRONT RANGE MINERAL BELT,
Colorado School of Mines Golden. Dept. of Chemistry; and Colorado School of Mines, Golden. Dept. of Geochemistry.
R. W. Klusman, and K. W. Edwards.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-256 212, $4.50 in paper copy, $3.00 in microfiche. Colorado Environmental Resources Center Fort Collins, June 1976. Completion Report Series No.72. 61 p, 6 fig, 23 tab, 54 ref, append. OWRT A-023-COLO(2).

Descriptors: Arsenic, Cadmium, Copper, Iron, Lead, Manganese, Mercury, Zinc, *Groundwater, *Heavy metals, Water pollution, Mining, Toxicity, Trace elements, *Colorado, *Mineralogy, Public health, Water analysis, *Pollutant identification, *Distribution patterns, Water quality standards.
Identifiers: Front Range mineral belt(Colo), Silver.

A study of toxic trace metal distribution in ground waters of the Front Range mineral belt, Colorado and adjacent areas was completed in order to determine the relationship of water quality to mineralization and the magnitude of potential health effects. Samples were collected and analyzed for arsenic, cadmium, copper, iron, lead, manganese, mercury, silver, znd zinc. Field determinations of pH, Eh, and specific conductance were also made. The samples were divided into two populations; those inside the mineral belt and those outside. Utilizing the observed data distributions, geochemical abundance estimates are made. The data distributions are normalized and corrected for analytical error and determinations below the detection limit, then expressed as a predicted central 95% range for each element in each population. The data are used to determine the probability of ground water exceeding the specified U.S. Public Health Service limit for each constituent.
W76-11105

CHLORIDE MANAGEMENT IN LAKE ERIE BASIN,
State Univ of New York at Buffalo. Dept of Civil Engineering
D. D. Meredith, and R. R. Rumer, Jr.
Available from the National Technical Information Service, Springfield, Va. 22161 as PB 256 241 $4.50 in paper copy, $3.00 in microfiche. Water Resources and Environmental Engineering Research Report No. 76-2, June 1976. 65 p, 17 fig, 8 tab, 57 ref. OWRT B-044-NY(3), 14-31-0001-5059.

Descriptors: *Lake Erie, *Chlorides, *Mathematical models, *Simulation analysis, Management, New York, *Deicers, Urban runoff, Salts, Model studies, Lakes, Water pollution sources, Path of pollutants.
Identifiers: Buffalo(NY), *Deicing salts.

The deicing salt runoff from Buffalo, New York and selected nearby communities has been measured and it was found that, in the case of Buffalo, approximately 90% of the deicing salt applied is recovered by the combined sewer system. The Lake Erie drainage basin was subdivided into regions and a search of the literature was made to establish the historical data for chloride discharge from each region. Time-dependent equations were estimated for the annual chloride discharge from each source region and used in conjunction with a mathematical model for chloride balance in Lake Erie. It was possible to fairly reproduce the historical trend of chloride build-up in Lake Erie by this method. The calibrated model projects a chloride concentration in Lake Erie of 137 ppm by the year 2050. The effects of selected salt management programs on future chloride levels in Lake Erie are examined utilizing the model. A simulation model for evaluating effects of deicing salt is developed and applied to a case study of Buffalo, New York. The model simulates the melting of snow due to deicing salt and computes economic costs and benefits. It is shown that the amount of deicing salt used is greater than can be justified economically using the model. The model should be used for helping highway maintenance directors determine an upper limit to the amount of salt that should be used.
W76-11114

MECHANISMS OF LEACHATE FORMATION IN SANITARY LANDFILLS,
University of Southern California, Los Angeles. Environmental Engineering Program.
K. Y. Chen, and F. R. Bowerman.
In: Recycling and Disposal of Solid Wastes, Edited by T. F. Yen Ann Arbor Science Publishers, Inc., Ann Arbor, Michigan, 1974. p. 349-367, 4 fig., 2 tab., 8 ref.

Descriptors: *Landfills, *Solid wastes, Aerobic conditions, Anaerobic conditions, Water pollution sources, *Leachate, Path of pollutants, *Decomposing organic matter, Percolation, Groundwater.
Identifiers: *Anaerobic decomposition.

The percolation of water through a landfill results in a solution with high concentrations of both organic and inorganic compounds, which is generally referred to as leachate. Refuse placed in a sanitary landfill undergoes biological, physical and chemical changes which results in decomposition of the refuse, production of leachate, and production of various gases. Leachate formation is affected by the types of waste material placed in the landfill; the temperature; pH and moisture placed in the landfill; the quality of external sources of water; and the composition of cover soil. Initial decomposition of refuse takes place aerobically. When all the oxygen available is consumed, anaerobic decomposition takes place. After leachate formation, the leachate will migrate in the direction of ground water flow with an additional vertical gradient. Ground water will dilute the leachate to some extent. (Grass-IsWWA)
W76-11118

FEM COUPLED WITH LP FOR WATER POLLUTION CONTROL,
Hiroshima Inst of Tech., Hatsukaichi (Japan).
T. Tatsumi, S. Tamai, and M. Yamazaki.
Journal of the Hydraulics Division, Proceedings of the American Society of Civil Engineers, Vol 102, No. HY7, Proceeding paper No. 12244, p 881-897, July 1976. 8 fig, 2 tab, 43 equ, 11 ref.

Descriptors: *Water pollution control, *Finite element analysis, *Linear programming, *Water quality, *Water resources, Assessment, Diffusion, Environmental effects, Planning, Mathematical models, Equations, Systems analysis, Optimization, Discharge(Water).
Identifiers: Double Fourier series.

The finite element (FE) and linear programming (LP) method has been developed in order to solve systems of differential equations with equality or inequality constraints and an objective function. The applicability of the FE and LP method is shown through numerical examples of water pollution problems governed by the convective diffusion equation. The method makes it possible to obtain the optimal discharges from the various types of outfall to meet water quality requirements, and also the distribution patterns of several water qualities in the water basin simultaneously. A new criterion for selecting the locations of outfalls and the optimal volumes of discharged wastewater may be given by the method. In order to check the results of the FE and LP method, an analytical method by the double Fourier series is developed and described briefly. (Bell-Cornell)
W76-11134

ESTIMATING FLOW CONDITIONS FOR RIVER MODELS,
Utah Water Research Lab., Logan.
W. J. Grenney, and D. S. Bowles
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, Vol. 102, No. EE4, Proceedings paper No. 12297, p 693-707, August 1976. 12 fig, 1 tab, 6 equ, 1 ref.

Descriptors: *Water pollution control, *River flow, *Streamflow, *Water quality, *Water resources, *Management, River basins, Water allocation(Policy), Irrigation water, Computer models, Systems analysis.
Identifiers: Boundary conditions, Mass balances.

River water quality models are important management tools for assessing the impact of point and diffuse pollution loads on the chemical and biological characteristics of the water at various points in a river network. In a river basin, the magnitude of the flow at any point and time is a dominant characteristic affecting pollutant concentration. Flows from headwaters, surface and subsurface lateral inflow, point loads, and diversions, as input as boundary conditions to water quality models so that the flow at any location on the river network can be computed. This paper describes a 'man-in-the-loop' computer model developed to utilize available historical streamflow data and user judgement to estimate flow boundary conditions for a water quality model. Applications of the model include the efficient allocation of irrigation water, and performing mass balances on any conservative substance, such as salinity. The model has been applied to the Weber River basin, located northeast of Salt Lake City, Utah. (Bell-Cornell)
W76-11136

RESPONSE OF SOUTH PLATTE TO EFFLUENT LIMITATIONS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.

D. W. Hendricks, and M. H. Bluestein.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, Vol. 102, No. EE4, p 745-768, Proceedings paper No. 12294, August 1976. 11 fig, 7 tab, 7 ref.

Descriptors: *Water quality, *Colorado, *Simulation analysis, *Computer models, *Sewage effluents, Limiting factors, Environmental engineering, Sanitary engineering, River systems, Systems analysis.
Identifiers: *South Platte river systems(Colo), *Federal laws, Systems engineering.

The South Platte river system is typical of many stream systems in the arid west. A computer simulation model has been used to project the water quality improvements resulting from implementation of 1977, 1983, and 1985 effluent quality limitation requirements of PL 92-500 for all waste discharges in the basin. Implementation of Pl 92-500 will result in continued good quality of waters in the mountains zone. The results of the simulation show that sufficient improvements of water quality in the plains zone will be achieved by 1983 to permit fish propagation and recreation. However, improvement in water quality along in the plains zone will result in few benefits at very high cost. Their achievement is essentially precluded by the modifications brought about by intense human uses of the stream and associated lands and by the limiting natural characteristics of the plains system. (Bell-Cornell)
W76-11137

DYNAMIC MODELLING AND CONTROL APPLICATIONS IN WATER QUALITY MAINTENANCE,
Cambridge Univ. (England). Dept. of Engineering.
For primary bibliographic entry see Field 5G.
W76-11142

FUNDAMENTALS OF DRIFT CONTROL BY DROPLET SIZE SELECTION,
Hercules Powder Co., Wilmington, Del. Synthetics Dept.
For primary bibliographic entry see Field 5G.
W76-11148

PHENOXY HERBICIDE RESIDUES AND THEIR PERSISTENCE,
Midwest Research Inst., Kansas City, Mo.
W. B. House, L. H. Goodman, H. M. Gadberry, and K. W. Dockter.
In: Aquatic Plant Control Program: Integrated Control of Alligator Weed and Water Hyacinth in Texas, Army Engineer Waterways Experiment Station, Vicksburg, Miss., Technical Report No. 1, March 1975, p. G3-G15. 50 ref.

Descriptors: *Herbicides, *Pesticide residues, Persistence, Agronomic crops, Pastures, Vegetation, Public health, Wildlife, Leaching, Aquatic life, Soil types, Weed control, Paraquat, Diquat, Resistance, Water pollution, 2,4-D, 2,4,5-T, Potable water, Degradation(Decomposition).
Identifiers: Phenoxyacetic acids, Silvex, Amitrole.

Crops grown in rotation and subsequent natural vegetation may be injured by residues remaining after herbicide treatment. Human health may also be threatened by accumulations of herbicide residues in plants which are then consumed by animals, birds, and fish. Leaching of herbicides to rivers, lakes and reservoirs can affect aquatic life and water quality. The persistance and residues of herbicides are reviewed. Many factors are involved in herbicide persistance in soils, but temperature, moisture, and soil type are especially important. Preplanting, pre-emergence, and post-emergence applications of herbicide to croplands can be made. Selection of the herbicide depends on weed specificity, speed of herbicide dissipation, and residue carry-over when crops are rotated. Weather conditions also affect the speed of dissipation. Tolerance of the primary and succeeding crops for the herbicide must also be considered. A serious problem involving the effect of herbicide residues and their persistence in the ecosystem involves the possible contamination of water supplies used for human consumption. Watersheds and drainage from cropped areas might cause secondary effects involving the health of domestic animals, wildlife, or aquatic life. Many of the studies described here have been concerned with phenoxyacetic acids and their esters, paraquat, diquat, silvex, and amitrole. (See also W76-11145) (Buchanan-Davidson--Wisconsin)
W76-11151

EFFECT OF TILLAGE SYSTEMS ON RUNOFF LOSSES OF PESTICIDES: A SIMULATED RAINFALL STUDY,
Iowa State Univ., Ames. Dept. of Agricultural Engineering.
J. L. Baker, H. P. Johnson, and J. M. Laflen.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-256 514, $5.50 in paper copy, $3.00 in microfiche. Completion Report, Iowa State Water Resources Research Institute, Ames, No. ISWRRI-71, June 1976. 98 p. 16 fig., 6 tab., 52 ref., append. OWRT B-050-1A(1) 14-31-0001-5073.

Descriptors: *Cultivation, *Simulated rainfall, *Pesticide residues, Adsorption, Herbicides, Insecticides, Sediments, Water yield, *Nutrient removal, Iowa, Soils, *Path of pollutants, Water loss, *Pesticide drift, Water pollution sources.
Identifiers: Lasso, Bladex, Dyfonate, Alachlor, Cyanazine, Fonofos, *Iowa Corn Belt.

Pesticide losses were measured from small plots subjected to simulated rainfall. The plots are established at three locations in Iowa, each with different soils and slopes. The plots were tilled parallel to the slope by six different tillage practices. One insecticide (fonofos) and two herbicides (alachlor and cyanazine) were applied to the soil at recommended rates shortly before simulating two rains at 6.35 cm/hr and a third at 12.7 cm/hr (totalling 21.6 cm). Concentrations of all three pesticides in both sediment and water sample decreased significantly with time. Pesticide concentrations in water were correlated with percent residue cover. Fonofos concentration in water were so low (avg. 0.014 ppm) that even though much more water than sediment was lost a major carrier was sediment (avg. of 1.8% of the fonofos applied was lost). The ratio of herbicide concentration sediment to that in water (ranged from 5 to 10) was less than the ratio of water to sediment lost; thus, water was the major carrier of the two herbicides. Decreases in herbicide losses from decreased runoff and erosion from plots with conservation tillage practices are negated by higher herbicide concentrations. For alachlor the average loss from all plots was 7.9% of that applied (8.0% for conventionally tilled plots); whereas, the average for cyanazine was 11.0% (9.7% for conventionally tilled plots). Sediment and water loss data as well as nutrient loss data for a companion study are given.
W76-11169

PETROLEUM COMPOUNDS IN THE MARINE FOOD WEB: SHORT-TERM EXPERIMENTS ON THE FATE OF NAPHTHALENE IN CALANUS,
Marine Biological Association of the United Kingdom, Plymouth (England). Plymouth Lab.
For primary bibliographic entry see Field 5C.
W76-11181

ECOLOGY OF THE LITTORAL POLYCHAETE STREPTOSYLLIS WEBSTERI, A NEW SPECIES IN THE BALTIC,
Morski Instytut Rybacki, Gdynia (Poland).
L. Zmudzinski.
OIKOS Supplementum 15, p. 133-134, 1973. 2 fig., 2 ref.

Descriptors: *Benthic fauna, Aquatic animals, *Benthos, Habitats, *Littoral, *Niches, Aquatic life, Salinity, Temperature, *Ecology, *Pollutant identification, Water pollution sources, *Path of pollutants.
Identifiers: *Baltic Sea, Species identification, *Polychaetes, *Streptosyllis websteri.

The polychaete Streotosyllis websteri has been discovered in the southern Baltic and is new to the Baltic. It is an eurythermic (0-18C), polyoxybionthic (4.8-7.8 ml 02/1 in the bottom water) and euryhaline species (from at least 7.5 to 15.0 0/00) and occurs in a narrow band along the Baltic south coast and on some adjacent banks on sandy and gravel grounds, mainly at depths of 10 to 30 m. It probably occurred earlier in western parts of the Baltic, but its presence there was overlooked. It is possible that it occurs along the western and eastern coasts of the central Baltic. (Katz)
W76-11186

EFFECTS OF SULFUR DIOXIDE AND/OR OZONE ON SEVERAL OAT VARIETIES, 1975 ANNUAL REPORT,
North Carolina State Univ., Raleigh.
For primary bibliographic entry see Field 5C.
W76-11190

INHIBITION OF NITRIFICATION BY AMMONIA AND NITROUS ACID,
Monteco Environmental Management Associates, Montgomery, N.Y.
For primary bibliographic entry see Field 5D.
W76-11197

THE ROLE OF CONVENTIONAL WASTEWATER TREATMENT IN COASTAL AREAS,
North Carolina Univ. at Chapel Hill. Wastewater Research Center.
For primary bibliographic entry see Field 5D.
W76-11229

SUMMARY: TECHNOLOGICAL ALTERNATIVES FOR WATER SUPPLY AND WASTEWATER DISPOSAL IN THE COASTAL AREA,
Clemson Univ. S. C. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5E.
W76-11230

PROCEEDINGS, SEVENTEENTH CONFERENCE ON GREAT LAKES RESEARCH, PART 1.
For primary bibliographic entry see Field 2H.
W76-11275

CRUSTACEAN ZOOPLANKTON OF SOUTHWESTERN LAKE ONTARIO IN 1972 DURING THE INTERNATIONAL FIELD YEAR FOR THE GREAT LAKES,
State Univ. Coll., Buffalo, N.Y. Great Lakes Lab.
For primary bibliographic entry see Field 2H.
W76-11276

VERTICAL INTERACTIONS IN PHYTOPLANKTON POPULATIONS - AN ASYMPTOTIC EIGENVALUE ANALYSIS,
Manhattan Coll., Bronx, N.Y. Environmental Engineering and Science Graduate Program.
For primary bibliographic entry see Field 2H.
W76-11277

DIELDRIN AND DDT: ACCUMULATION FROM WATER AND FOOD BY LAKE TROUT (SALVELINUS NAMAYCUSH) IN THE LABORATORY,
Bureau of Commercial Fisheries, Ann Arbor, Mich. Great Lakes Fishery Lab.

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For primary bibliographic entry see Field 5C.
W76-11279

TEMPORAL AND SPATIAL DISTRIBUTIONS OF PLANKTONIC ROTIFERS IN MILWAUKEE HARBOR AND ADJACENT LAKE MICHIGAN,
Wisconsin Univ., Milwaukee. Center for Great Lakes Studies.
For primary bibliographic entry see Field 2H.
W76-11285

MODELING OF PHYTOPLANKTON IN LAKE ONTARIO,
Manhattan Coll., Bronx, N. Y. Environmental Engineering and Science.
For primary bibliographic entry see Field 5C.
W76-11286

PLUTONIUM DISTRIBUTION IN LAKE MICHIGAN BIOTA,
Argonne National Lab., Ill. Radiological and Environmental Research Div.
For primary bibliographic entry see Field 2H.
W76-11287

PHOSPHORUS MOBILITY IN LAKE ONTARIO SEDIMENTS,
Wisconsin Univ., Madison. Water Chemistry Lab.
R. T. Bannerman, D. E. Armstrong, G. C. Holdren, and R. F. Harris.
In: Proceedings, Seventeenth Conference on Great Lakes Research, Part 1; McMaster University, Hamilton (Ontario), August 12-14, 1974. International Association for Great Lakes Research, p 158-178, 1974. 4 fig, 13 tab, 33 ref. EPA R-800609, USDA 12-14-3001-226.

Descriptors: *Phosphorus, *Lake sediments, *Lake Ontario, Inorganic compounds, Phosphorus compounds, Sediments, Sorption, Chemistry, Analytical techniques, Cores, Core drilling, Sampling, Surveys, Lakes, Limnology.
Identifiers: *International Field Year for the Great Lakes, Inorganic phosphorus.

Sediment cores were obtained from 15 lake stations representing the three major basins and the inshore zone of Lake Ontario. Cores were sectioned for characterization of the surface sediments according to inorganic P chemical mobility. Physical mobility was characterized by measurement of P release from intact cores incubated under controlled laboratory conditions. The proportions of potentially chemically mobile inorganic P were usually high (30 to 60%) in the central basin sediments and low (2 to 8%) for the inshore zone sediments. Although the amounts of inorganic P desorbed after three successive equilibrations of Lake Ontario sediments represented only 3 to 17% of the potentially mobile inorganic P, sufficient inorganic P was desorbed to restore a large part of the original interstitial inorganic P concentrations. Interstitial inorganic P (mobile P) concentrations ranged from 14 to 1280 micrograms/liter and were higher than dissolved inorganic P concentrations in the overlying water. Diffusion rates estimated from the range of observed interstitial inorganic P values ranged from about 0.05 to 0.6 mg/sq m/day and were in agreement with the range of 0.03 to 0.8 mg/sq m day estimated from P release rates from intact cores incubated under controlled laboratory conditions. Based on an inorganic P flux of 0.2 mg/sq m/day, the estimated annual contribution of inorganic P to Lake Ontario water is equal to about 10% of the external P loading. (See also W76-11275) (Sims - ISWS)
W76-11288

STUDIES OF PLUTONIUM CYCLING AND SEDIMENTATION IN LAKE MICHIGAN,
Argonne National Lab., Ill. Radiological and Environmental Research Div.
M. A. Wahlgren, and D. M. Nelson.
In: Proceedings, Seventeenth Conference on Great Lakes Research, Part 1, McMaster University, Hamilton (Ontario), August 12-14, 1974. International Association for Great Lakes Research, p 212-218, 1974. 3 fig, 1 tab, 20 ref.

Descriptors: *Radioisotopes, *Sediments, *Plankton, *Lake Michigan, Zooplankton, Phytoplankton, Turnovers, Mixing, Lakes, Sampling, Surveys, Suspended solids, Lake sediments, Detritus, Path of pollutants, Radioactive wastes, Sedimentation, Cesium
Identifiers: *Plutonium.

Estimates of cumulative deposition, together with the results of extensive lakewide sampling in 1972, yielded estimates of mean halftimes for removal from the water column of Lake Michigan of 1.0 + or - 0.3 yr for Pu239,240, and 1.4 + or - 0.3 yr for Cs137. However, data from 1971, 1972 and 1973 water samples indicate that the recent half-time is much greater than the 1963 1972 average, presently being on the order of 3 to 4 yrs for both Pu239 and Cs137. The longer turnover time is consistent with the Cs137 turnover time in the water column deduced from analysis of preserved Lake Michigan alewives. Water filtration experiments have demonstrated that greater than 75% of the plutonium is nonfilterable and is present as colloid or sub-colloidal sized fractions. At an offshore station near Grand Haven, Michigan, the concentration of Cs137 in the epilimnion underwent a slight but significant decline from June to November, whereas Pu239 was reduced to a small fraction of its spring value. In net plankton samples dominated by phytoplankton a much lower mean Cs137:Pu239 ratio is observed than in water samples, indicating a preferential sorption of Pu239 over Cs137 by phytoplankton. The results of these experiments suggested that sorption by phytoplankton (and the subsequent rapid settling from the epilimnion of phytodetritus and/or zooplankton fecal pellets) is responsible for the rapid removal of Pu239 from the epilimnion. (See also W76-11275) (Sims - ISWS)
W76-11292

OCCURRENCE OF AS, CD, CO, CR, CU, FE, HG, NI, SB, AND ZN IN LAKE ERIE SEDIMENTS,
Bowling Green State Univ., Ohio. Dept. of Geology.
L. J. Walters, Jr., T. J. Wolery, and R. D. Myser.
In: Proceedings, Seventeenth Conference on Great Lakes Research, Part 1; McMaster University, Hamilton (Ontario), August 12-14, 1974. International Association for Great Lakes Research, p 219-234, 1974. 5 fig, 4 tab, 40 ref. OWRT A-032-OHIO(3).

Descriptors: *Heavy metals, *Sediments, *Lake Erie, *Great Lakes, Pollutants, Water pollution, Industrial wastes, Metals, Lake sediments, Cores, Sampling, Harbors, Lakes, Sedimentation.
Identifiers: Heavy metal enrichment.

Ten trace and minor elements (Fe, Cr, Co, Cd, Zn, Ni, Sb, As, Hg, and Cu) were determined in sediment cores from eight stations in Lake Erie. The cores were representative of sediments in the western, central, and eastern basins of the lake and included one core each from the harbors of Cleveland and Buffalo. The results generally showed significant enrichments witin the upper thirty cm of bottom sediment for all metals except iron and cobalt. Each harbor core contained high enrichments of most heavy metals but reflected an individual pollution history. Lower magnitudes of enrichment were found in the open lake cores, which generally decreased going from the western basin toward the eastern basin. The order of enrichment by metal was (from least to greatest): Fe, Co, Ni, As, Cr, Zn, Cu, Sb, Cd, Hg. Mercury dating shows that the heavy metal inputs apparently underwent major increases in the period 1948-1955. Intermittent pollution inputs cause irregular concentration-depth profiles which are probably altered to a minor extent by upward transport of metal in the sediment column via a reaction-diffusion mechanism. In 48% of the cases the top interval of the sediment column showed a decrease in heavy metal content. The order of surface enrichment for the metals correlated with the order of ionization potentials, electron affinities, and electronegativities, and suggested that some chemical process is active in controlling the distribution and concentration of the heavy metals. (See also W76-11275) (Sims - ISWS)
W76-11293

POLLUTANT MERCURY AND SEDIMENTATION IN THE WESTERN BASIN OF LAKE ERIE,
Bowling Green State Univ., Ohio. Dept. of Geology.
T. J. Wolery, and L. J. Walters, Jr.
In: Proceedings, Seventeenth Conference on Great Lakes Research, Part 1, McMaster University, Hamilton (Ontario), August 12-14, 1974. International Association for Great Lakes Research, p 235-249, 1974. 5 fig, 2 tab, 41 ref. OWRT A-032-OHIO(4).

Descriptors: *Mercury, *Sediments, *Lake Erie, Sedimentation, Industrial wastes, Sedimentation rates, Pollutants, Water pollution, Water pollution sources, Sampling, Surveys, Cores, Model studies, Mathematical models, Sludge worms, Benthic fauna, Biochemistry.

Mercury concentrations in the sediments of the western basin of Lake Erie generally decrease with depth to a background level. The point at which the background value is reached in a sediment column represents the time (1939) of the first of two major increases in the rate of pollutant-mercury input to the western basin. A second increase in the rate of input correlates with a major plant expansion in the local chlor-alkali industry in 1954. These points of sudden increase of mercury concentration in the mercury-depth profiles have been used to obtain modern sedimentation rates for the bottom sediments of the western basin at a total of 64 stations. The method relies on the extremely high enrichment of mercury over background levels, good historical documentation of industrial inputs, fast dispersal of these inputs over the basin, and the lack of sufficient post-depositional alteration of the mercury depth profile in the study area. Confirmation of the method was found by: (1) internal consistency with respect to the two episodes of increase in input of mercury, (2) good correlation with a less precise chromium method, and (3) correlation with pollen-dated cores. Estimated rates of sedimentation ranged from 0.06 to 1.5 cm/yr in areas of active sedimentation, with a mean rate over these areas of 0.44 cm/yr. A model was proposed in which clean sediment is deposited over a homogeneous mercury reservoir, which loses mercury to the overlying water mass according to first-order kinetics until a critical depth is reached. (See also W76-11275) (Sims - ISWS)
W76-11294

FIELD OBSERVATIONS OF THE DYNAMICS OF HEATED DISCHARGE JETS,
Argonne National Lab., Ill. Energy and Environmental Systems Div.
A. A. Frigo, S. M. Zivi, R. F. King, and E. D. Levinson.
In: Proceedings, Seventeenth Conference on Great Lakes Research, Part 1; McMaster University, Hamilton (Ontario), August 12-14, 1974. International Association for Great Lakes Research, p 412-424, 1974. 11 fig, 1 tab, 3 ref. AEC W-31-109-ENG-38.

Descriptors: *Discharge(Water), *Powerplants, *Lake Michigan, Heated water, Cooling water, Temperature, Water temperature, Flow, Jets, Currents(Water), Electric powerplants, Nuclear powerplants, Hydrodynamics, Lakes, On-site in-

stigations, On-site data collections, *Path of llutants, *Dynamics.
entifiers: Temperature oscillations, Discharge ts, Discharge plumes.

eld studies of the dynamics of heated discharge ts were conducted during 1973 at the Point ach, J. H. Campbell, and Waukegan Power ants located on Lake Michigan. Measurements temperature and velocity were made from small at anchored near the end of the power plant's rface discharge canals. An aluminum bar uipped with fast response thermistor was wered over the side of the boat so that water mperatures were sensed simultaneously from a ter surface to a depth of three meters. A full set temperatures was sampled every two seconds. multaneously, the local water velocity is mea- red and recorded at similar time intervals. herent temperature oscillations were observed th several Celsius degree magnitudes and with riods ranging from 2 min to 20 min, depending the plant. Oscillations in velocity were ob- rved at the corresponding frequencies, and were herent with the temperatures. (See also W76-275) (Sims - ISWS)
76-11307

NUMERICAL MODEL FOR THERMAL UMES AND RIVER DISCHARGES,
se Western Reserve Univ. Cleveland, Ohio. pt. of Earth Sciences.
F. Paul, and W. J. Lick.
Proceedings, Seventeenth Conference on eat Lakes Research, Part 1; McMaster Univer- y, Hamilton (Ontario), August 12-14, 1974. In- national Association for Great Lakes Research, 45-455, 1974. 17 fig, 1 tab, 18 ref.

scriptors: *Model studies, *Discharge(Water), ake Erie, *Lake Michigan, Rivers, Power- nts, Mathematical models, Flow, Temperature, ter temperature, Lakes, Outlet works, hermal pollution, Hydraulics, Hydrodynamics. ntifiers: *Cuyahoga River(Ohio), Thermal mes.

numerical model for the time-dependent, three- nensional, variable-density flow from a horizon- rectangular discharge into a basin has been veloped. Steady-state results were presented for resentative flow conditions of the Cuyahoga er entering Lake Erie and of the Point Beach wer Plant thermal discharge into Lake chigan. Results for three different cases of the yahoga River were given. Two cases were for ted discharge at different flow rates entering a stant depth basin. The lower rate corresponded lows typical of the late summer months and the her flow rate corresponded to flows typical of spring. The third case was for the low flow rate ted discharge entering a variable-depth basin. e depth variation was such that the basin depth bled in two and one-half river widths and then ained constant. This depth variation was not listic for the Cuyahoga River, but it was used to icate the importance of the variable-depth in. For the Point Beach thermal discharge cal- ation, the vertical eddy coefficient was as- ed to be a function of the local vertical tem- ature gradient and the actual bottom topog- hy was used. (See also W76-11275) (Sims - VS)
6-11310

DELING CHLORIDE DISTRIBUTION IN GINAW BAY,
vironmental Protection Agency, Gross Ile, h. Gross Ile Lab.
L. Richardson.
Proceedings, Seventeenth Conference on at Lakes Research, Part 1; McMaster Univer- , Hamilton (Ontario), August 12-14, 1974. In- ational Association for Great Lakes Research, 2-470, 1974. 6 fig, 4 tab, 10 ref.

Descriptors: *Model studies, *Chlorides, *Bays, *Lake Huron, Watersheds(Basins), Mathematical models, Circulation, Water circulation, Water quality, Water pollution, Pollutants, Runoff, Water chemistry, *Path of pollutants.
Identifiers: *Saginaw Bay(Mich).

A steady-state, finite difference model has been structured for Saginaw Bay to analyze average circulation patterns by tracing chlorides through the system. Model inputs include chloride loads from tributaries, segment volumes, segment interface areas and boundary conditions at Lake Huron. The model also requires advection and dispersion transport between adjacent segments which are the 'unknowns'. Model output is the average chloride concentration in each model segment. Initial assumptions of average flow (advection) were made. Although circulation is highly dependent on wind conditions and change rapidly, the type of model employed uses average circulation and considers the highly transient phenomena as part of the dispersion transport. Sensitivity analyses were performed by varying flow and dispersion until a reasonable fit was obtained with the observed chloride concentrations. (See also W76-11275) (Sims-ISWS)
W76-11312

SOURCE IDENTIFICATION OF FUEL OIL SPILLS,
Ontario Ministry of the Environment, Rexdale. Lab. Services Branch.
For primary bibliographic entry see Field 5A.
W76-11314

BACTERIA AND PHOSPHORUS AS INDICATORS OF THE EXTENT OF A LARGE SEWAGE SPILL IN LAKE ERIE,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5A.
W76-11315

WATER QUALITY MODEL OF THE LOWER FOX RIVER, WISCONSIN,
Environmental Protection Agency, Anchorage, Alaska. Alaska Operations Office.
D. Crevensten, and A. Stoddard.
In: Proceedings, Seventeenth Conference on Great Lakes Research, Part 1; McMaster University, Hamilton (Ontario), August 12-14, 1974. International Association for Great Lakes Research, p 501-513, 1974. 8 fig, 3 tab, 14 ref.

Descriptors: *Model studies, *Water quality, *Dissolved oxygen, *Rivers, *Wisconsin, Mathematical models, Oxygen demand, Biochemical oxygen demand, Chemical oxygen demand, Oxygen, Oxygenation, Reaeration, Dams, Algae, Pollutants, Water pollution, Surveys, Waste disposal, Waste treatment.
Identifiers: *Fox River(Wis), Effluent limits.

A mathematical model describing the interrelationship between the dissolved oxygen concentration of a river and its various sources and sinks has been adapted for use in a study of the Lower Fox River in Wisconsin. The analysis assumes steady-state conditions and described the longitudinal distribution of dissolved oxygen in the river from Neenah-Menasha to Green Bay, a distance of approximately 64.4 km. The sources of dissolved oxygen included in the model are atmospheric reaeration, algal photosynthetic activity, and reaeration over dams. The sinks of dissolved oxygen considered are carbonaceous biochemical oxygen demand, nitrogenous biochemical oxygen demand, sludge oxygen demand, and algal respiration. The model was verified for various conditions of waste loading, river temperature and river flow. The model then was used to evaluate the effect on water quality of implementing interim best practicable control technology effluent limitations for industrial discharges and 90% biochemical oxygen demand removal limitations for municipal sources. The study indicated that implementation of the above effluent limits will result in a significant improvement in water quality in the Lower Fox River. A daily average dissolved oxygen concentration of 4 to 5 mg/l will be maintained under low-flow, summer conditions and will not fall below 4 mg/l more than about 2% of the time during extreme low-flow and high temperature situations. (See also W76-11275) (Sims - ISWS)
W76-11316

A SIMULATION MODEL FOR PHOSPHORUS WASTE DISCHARGES IN THE LAKE ERIE BASIN,
Case Western Reserve Univ., Cleveland, Ohio. Dept. of Chemical Engineering.
R. Prober, and P. B. Melnyk.
In: Proceedings, Seventeenth Conference on Great Lakes Research, Part 1; McMaster University, Hamilton (Ontario), August 12-14, 1974. International Association for Great Lakes Research, p 514-519, 1974. 4 fig, 1 tab, 5 ref.

Descriptors: *Phosphorus, *Model studies, *Waste disposal, *Lake Erie, Mathematical models, Forecasting, Watersheds(Basins), Water treatment, Waste water treatment, Pollutants, Water pollution, Phosphorus compounds, Nutrients, Nutrient removal, Detergents, Water pollution sources, Chemical wastes, Lakes.

An aggregated simulation model was presented for pollutant generation and wastewater treatment in the Lake Erie watershed. Based on total capacities for treatment, the model calculated daily average discharges into receiving waters as well as total capital and operating costs for treatment. This is done separately for the five watershed sub-basins. Calculated results were presented for planning scenarios for phosphorus control which consist of schedules for: (1) fraction of wastewaters treated, (2) fraction of treated wastewater receiving secondary or advanced treatment, (3) phosphorus content of advanced treatment effluents, and (4) detergent phosphorus usage per capita. One scenario approximates present planning for implementation of advanced treatment and upgrading of conventional facilities. By the mid-1980's, this is predicted to reduce discharges by 30% for solid phosphorus and by 70% for dissolved phosphorus. However, population and economic growth at historic levels would negate these improvements, increasing discharges back almost to 1970 levels by 2020 despite continuing new plant construction and more severe advanced treatment. For comparison, another scenario considers elimination of detergent phosphorus. This, along with planned expansions of conventional treatment, would achieve reductions of phosphorus discharges quite similar to the present planning, but without the costs for advanced treatment. (See also W76-11275) (Sims - ISWS)
W76-11317

CHLORIDE BUILD-UP AND CONTROL IN LAKE ERIE,
State Univ. of New York at Buffalo.
R. R. Rumer, Jr., D. D. Meredith, and C. C. Chien.
In: Proceedings, Seventeenth Conference on Great Lakes Research, Part 1; McMaster University, Hamilton (Ontario), August 12-14, 1974. International Association for Great Lakes Research, p 520-534, 1974. 16 fig, 1 tab, 10 ref. OWRT B-044-NY (2), 14-31-0001-5095.

Descriptors: *Chlorides, *Lake Erie, *Model studies, Mathematical models, Forecasting, Sodium chloride, Salts, Deicers, Snow removal, Runoff, Urban runoff, Surface runoff, Water pollution sources, Pollution abatement, Lakes, Water pollution control.
Identifiers: *Buffalo(NY), Chloride balance, Chloride control.

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The de-icing salt runoff from Buffalo, New York, and selected nearby communities has been measured. It was found that, in the case of Buffalo, approximately 90% of the de-icing salt applied is recovered by the combined sewer system. The Lake Erie drainage basin was subdivided into regions and a search of the literature was made to establish the historical data for chloride discharge from each region. Time-dependent equations were estimated for the annual chloride discharge from each source region and used in conjunction with a mathematical model for chloride balance in Lake Erie. It was possible to fairly reproduce the historical trend of chloride build-up in Lake Erie by this method. The calibrated model projects a chloride concentration in Lake Erie of 135 ppm by the year 2050. The effects of a few selected salt management programs on future chloride levels in Lake Erie were examined utilizing the model. (See also W76-11275) (Sims - ISWS)
W76-11318

THE EFFECT OF A FOSSIL FUEL POWER PLANT'S COOLING WATER SYSTEM ON THE WATER QUALITY OF GREEN BAY, WISCONSIN,
Wisconsin Univ., Green Bay. Coll. of Environmental Sciences.
J. H. Wiersma, I. K. Iskandar, L. J. Schwartz, R. W. Lanz, and C. C. Weber.
In: Proceedings, Seventeenth Conference on Great Lakes Research, Part 1; McMaster University, Hamilton(Ontario), August 12-14, 1974. International Association for Great Lakes Research, p 535-543, 1974. 2 fig, 4 tab, 18 ref.

Descriptors: *Cooling water, *Powerplants, *Water quality, *Wisconsin, *Lake Michigan, Surveys, Sampling, Bays, Rivers, Temperature, Water temperature, Water cooling, Chemicals, Nutrients, Bacteria, Dissolved oxygen, Trace elements, Water pollution, Water pollution sources, Pollutants.
Identifiers: *Green Bay(Wis), *Fox River(Wis).

During 1973, water samples were collected in duplicate from two separate intakes and the outfall of a 439 megawatt (e) coal-fired power plant located at the confluence of the Fox River and lower Green Bay arm of Lake Michigan. Condenser cooling water for the plant is obtained from both the Fox River and lower Green Bay. Temperature and dissolved oxygen were monitored continuously in the two intakes and outfall. Twenty-two physical-chemical water quality parameters were measured monthly. Bacterial studies were conducted concurrently with the water chemistry studies. Trace elements were determined quarterly. Primary productivity studies were also conducted during summer months in the vicinity of the power plant. Minimum temperature differences between the intakes and the outfall occurred during the critical summer months and maximum temperature changes during the very cold months of the year. No significant losses of dissolved oxygen were found in the condenser discharge water but super-saturation occurred during the spring, primarily in April. The intake waters were generally high in nutrients (especially phosphorus) and turbidity. For most parameters the composition of the outfall water did not vary significantly from that of the intakes. However, sporadic significant changes were detected in ortho-phosphorus, total phosphorus, nitrite, turbidity, conductivity, ammonia, total silica, and iron. Bacterial populations in the intake and discharge waters of the electric generating plant varied widely. The heated discharge water alone had little or no effect on either the bacterial populations or primary productivity. (See also W76-11275) (Sims - ISWS)
W76-11319

A SIMULATION MODEL FOR LONG-TERM FORECASTING OF WASTE LOADINGS FROM POPULATION, LAND USE, AND ECONOMIC ACTIVITIES IN THE GREAT LAKES BASIN,
Canada Centre for Inland Waters, Burlington (Ontario).
D. E. Coleman, J. P. H. Batteke, and S. Madras.
In: Proceedings, Seventeenth Conference on Great Lakes Research, Part 1; McMaster University, Hamilton (Ontario), August 12-14, 1974. International Association for Great Lakes Research, p 544-548, 1974. 5 fig, 4 ref

Descriptors: *Model studies, *Forecasting, *Water quality, *Economics, *Great Lakes, Mathematical models, Land use, Population, Economic prediction, Economic impact, Waste disposal, Social aspects, Social impact, Lakes, Pollutants, Technology, Social values, Simulation analysis, Computer models

The water quality of the Great Lakes is a time-lagged reflection of human and other natural activities in the basin. Whereas levels of waste loadings and economic activities are well correlated, changes in people's attitudes towards water quality will, in the long run, affect the nature of this correlation in many different ways. Traditionally, one forecasting technique has employed statistical methods based on extrapolation of curves fitted to historical data and multiple regressive techniques for estimating equations. Such an approach could be called naive for longterm forecasting purposes because it does not handle adequately the causal relationships and interactions among the numerous economic, social and technical parameters. If the nature of the causal mechanism changes, forecasting errors will result. However, changes in the causal relationships are the essence of the long-term forecasting problem. The alternative approach to forecasting, the use of a dynamic simulation model, provides much more flexibility in that it allows incorporation of gradual changes in social and economic 'constraints'. Also, this methodology permits the introduction of descriptive knowledge, in addition to numerical knowledge. The emphasis is on explaining interactions by means of feedback loops in quantitative terms, rather than on providing rigidly qualified statistical results. The simulation model provides a reliable extension to intuitive reasoning. (See also W76-11275) (Sims - ISWS)
W76-11320

AN ECONOMETRIC FORECASTING MODEL FOR THE MAJOR METROPOLITAN AREAS IN THE LAKE ERIE BASIN,
Case Western Reserve Univ., Cleveland, Ohio. Dept. of Economics.
M. D. McCarthy, and C. Loxley.
In: Proceedings, Seventeenth Conference on Great Lakes Research, Part 1; McMaster University, Hamilton (Ontario), August 12-14, 1974. International Association for Great Lakes Research, p 574-586, 1974. 6 tab, 3 ref.

Descriptors: *Model studies, *Econometrics, *Water pollution, *Lake Erie, Mathematical models, Simulation analysis, Forecasting, Population, Economics, Employment, Economic impact, Water quality, Phosphorus, Cities, Wages, Water pollution sources.
Identifiers: *Econometric forecasting models, *Cleveland(Ohio), Manufacturing.

An econometric model has been developed that can forecast and simulate long-run economic trends for the major standard metropolitan statistical areas (SMSAs) in the Lake Erie Basin. Its design is such that it can be made part of an intergrated modelling approach to phosphorus pollution in Lake Erie. The strategy adopted is to apply a dynamic aggregate general model to the major metropolitan area within each water-resource area. This approach is thus a relatively inexpensive way to deal with such a large area given the available data base. The analysis starts by presuming that aggregate U.S. economic trends are the principal determinant of manufacturing output and employment. The regional model is therefore linked to, and driven by, forecasts for the U. S. taken from an available national econometric model. Key variables, manufacturing employment and total population are determined from local behavioral relationships. The paper described the algebraic structure of an abstract general metropolitan model and presented details of its application to the Cleveland SMSA and the extrapolation of results to the Southern Lake Erie area. The estimates for each equation were presented along with graphs illustrating their performance, and the results of the complete model simulations were discussed. (See also W76-11275) (Sims - ISWS)
W76-11322

PHOSPHORUS CYCLING AND LUXURY PHOSPHORUS STORAGE BY ALGAE IN THE WATERS OF GREEN BAY,
Wisconsin Univ., Green Bay. Coll. of Environmental Sciences.
For primary bibliographic entry see Field 5C.
W76-11342

HOW TO DISPOSE OF TOXIC SUBSTANCES AND INDUSTRIAL WASTES.
Noyes Data Corporation, Park Ridge, N.J.
For primary bibliographic entry see Field 5E.
W76-11368

AN EXPERIMENTAL HIGH-ASH PAPER MILL SLUDGE LANDFILL,
Michigan State Univ., East Lansing.
For primary bibliographic entry see Field 5E.
W76-11379

AGRICULTURE AND CLEAN WATER—PROCEEDINGS OF A CONFERENCE TO EXPLORE CONTROL STRATEGY FOR AGRICULTURAL NONPOINT SOURCE WATER POLLUTION.
For primary bibliographic entry see Field 5G.
W76-11406

BENEATH THE TENN-TOM,
Geological Survey, Nashville, Tenn.
For primary bibliographic entry see Field 4A.
W76-11415

GROUND-WATER FLOW AND POLLUTION A A WELL FIELD, OLEAN, NEW YORK,
Geological Survey, Albany, N. Y.
A. D. Randall.
Open-file Report 76-397, June 1976. 21 p, 10 fig, tab, 6 ref.

Descriptors: *Water pollution source *Groundwater, *Water wells, *Path of pollutant *Groundwater movement, Aquifer characteristic Pumping, Drawdown, Water quality, Samplin Nitrogen compounds, *New York, Monitoring.
Identifiers: Olean(NY), Well field.

From September 1970 through October 1975, t U. S. Geological Survey investigated and mon tored ground-water pollution at a well field Olean, N. Y. Ground-water withdrawal at Nor Olean has created a cone of depression as deep 30 feet. Ground water near the well field has be polluted by petroleum, hexavalent chromium an most recently, nitrogen compounds. The appare source of the nitrogen compounds is near land su face in a small area nearly 2,000 feet southwest the center of the well field. From 1970 to 197 concentrations of ammonia plus nitrate have reg larly exceeded 2,000 mg/liter as nitrogen in wat from three test wells. All of the nitrogen-bearin water flows toward the center of the well field a is eventually withdrawn by wells. If all pumpi near North Olean were to cease, 4 to 8 mont might be required to fill the cone of depressio

hereafter the polluted water would move radually to the south or southwest at a rate of oughly 4,500 feet in 12 years. (Woodard-USGS)
V76-11417

NALYSIS OF SELECTED BENTHIC COMMUNITIES IN THE FLORIDA EVERGLADES WITH REFERENCE TO THEIR PHYSICAL ND CHEMICAL ENVIRONMENT,
eological Survey, Tallahassee, Fla.
or primary bibliographic entry see Field 5A.
V76-11418

ROCEEDINGS, SEVENTEENTH CONERENCE ON GREAT LAKES RESEARCH, ART 2.
or primary bibliographic entry see Field 2H.
V76-11424

FYGL STREAM MATERIALS BALANCE TUDY,
nvironmental Protection Agency, Rochester, N.
. J. Casey, and S. E. Salbach.
n: Proceedings, Seventeenth Conference on reat Lakes Research, Part 2; McMaster Univerty, Hamilton (Ontario), August 12-14, 1974. Inrnational Association for Great Lakes Research, 668-681, 1974. 9 fig, 3 tab, 8 ref.

escriptors: *Streams, *Chemicals, *Runoff, Lake Ontario, Lakes, Rivers, Sampling, Surveys, hosphorus, Nitrogen, Chlorides, Nitrates, ulfates, Metals, Materials, Pollutants, Water polution sources, Nutrients, Precipitaon(Atmospheric), Chemistry, *Path of pollunts.
lentifiers: *International Field Year for the Great akes, Materials balance.

report is presented of the results of studies conucted as part of the International Field Year reat Lakes by the U. S. Environmental Protecon Agency and the Ontario Ministry for the Enronment to determine the amount of materials ntering and leaving Lake Ontario. Owing to udget considerations and hydrologic differences, e Canadian and U. S. programs differed in reard to the frequency of stream sampling and, to me extent, in regard to parameters measured. he paper addressed mean annual loadings to ake Ontario for total phosphorus, soluble hosphorus, ammonia, total nitrogen, nitrate, lfate and various metals. A materials balance udget for total phosphorus, total nitrogen, and loride for lake Ontario has been calculated. The oblem of determing what frequency of stream mpling would produce the best results was scussed. (See also W76-11424) (Sims - ISWS)
76-11429

EAVY MINERALS IN THE SANDS OF OUTHERN AND EASTERN LAKE ONTARIO,
ochester Univ. N. Y. Dept. of Geological iences.
or primary bibliographic entry see Field 2J.
76-11431

HOSPHATE, ALGAE, AND TACONITE AILINGS IN THE WESTERN ARM OF LAKE PERIOR,
xas Univ. at Dallas. Richardson. Inst. for Enronmental Sciences.
r primary bibliographic entry see Field 5C.
76-11441

MODEL FOR THE STUDY OF EPISODES IN IE DISPERSION OF A CONSERVATIVE POLTANT IN LAKE MICHIGAN,
nois Univ., at Chicago Circle, Chicago. Dept. of formation Engineering.
M. Schwab, and P. L. Katz.
In: Proceedings, Seventeenth Conference on Great Lakes Research, Part 2; McMaster University, Hamilton (Ontario), August 12-14, 1974. International Association for Great Lakes Research, New York, p 837-845, 1974. 5 fig, 1 tab, 15 ref.

Descriptors: *Model studies, *Pollutants, *Dispersion, *Lake Michigan, Water pollution, Lakes, Nutrients, Circulation, Water circulation, Mixing, Winds, Simulation analysis, Mathematical models, Water quality, *Path of pollutants, Thermal stratification, Limnology.
Identifiers: *Pollutant dispersion.

Simulation of a conservative pollutant's two dimensional dispersion in vertically stratified (summer) Lake Michigan, using circulation patterns from an existing model, makes possible the study of short term pollution episodes. Discharges may be traced from one or more sources, for a variety of sequences of wind forcing. The finite difference scheme strictly conserves pollutant mass, even if the underlying circulation patterns contain possible inconsistencies. Dispersion of a hypothetical conservative pollutant for an actual 125 day period was simulated using U. S. Weather Service wind histories and using USEPA 'STORET' chloride discharge data for 28 sources to represent typical discharge levels. In addition, 'best' and 'worst' cases were demonstrated, for 33 day episodes following the assumed discharge of a single 'slug' of pollutant into Calumet Harbor, using two actual 33 day wind histories from 1970-71. Wind and resulting circulation histories have a marked effect on pollutant dispersion. Under (worst case) variable wind conditions, even a single 'slug' discharge can result in several weeks of concentration buildup in adjacent nearshore regions. Under (best case) constant winds, the flushing action of coastal jets prevents such a buildup. This has implications in terms of water quality standards for pollutant discharges into large lakes. (See also W76-11424) (Sims - ISWS)
W76-11442

THE DISPERSION OF POLLUTANTS BENEATH OPEN CHANNELS,
California Univ., Santa Barbara. Dept. of Mechanical and Environmental Engineering.
J. C. Bruch Jr., and P. Smith.
Water Air Soil Pollut. 2(1), p 23-34, 1973.

Descriptors: *Dispersion, Open channel flow, Channels, Pollutants, Seepage, Porous media, Flow, *Path of pollutants, Capillary fringe.
Identifiers: Lateral-longitudinal dispersion.

An experiment and a numerical scheme which combine previously given methods for the dispersion and seepage phenomena were presented to describe the dispersion of a pollutant in porous media beneath a triangular channel. The combined effect of longitudinal and lateral dispersion was considered. Numerical concentration profiles are given along with a comparison of experimental and numerical data. The technique suggested can be extended to other channel shapes and flow fields accounting for the capillary fringe.--Copyright 1974, Biological Abstracts, Inc.
W76-11443

PARTICULATE RESIDENCE TIMES,
Atmospheric Environment Service, Toronto (Ontario).
For primary bibliographic entry see Field 5A.
W76-11450

FALLOUT 137CS IN THE SOILS AND SEDIMENTS OF THREE SMALL WATERSHEDS,
Agricultural Research Service, Oxford, Miss. Sedimentation Lab.
J. C. Ritchie, J. R. McHenry, and A. C. Gill.
Ecology. 55(4), p 887-890, 1974.

Descriptors: *Radioisotopes, *Mississippi, *Watersheds(Basins), Distribution patterns, Path of pollutants, Grasses, Crops, Forests, Erosion, Soils, *Sediments.
Identifiers: *Cesium-137.

A budget for the distribution of fallout 137Cs was calculated for 3 small watersheds in northern Mississippi. The cover in 1 contributing watershed is predominantly forest, in the 2nd it is predominantly grass, and in the 3rd predominantly grass and crops. Of the total 137Cs input, 97%, 88% and 85% remained in the forest, the grass and the grass-crop watersheds. The concentration of 137Cs per unit area in the reservoir sediments was 2.8, 3.8 and 4.0 times that of the soils from the respective contributing watersheds, indicating that the reservoirs are acting as 'traps' for 137Cs. Of the 137Cs eroded from the 3 contributing watersheds, 57%, 38% and 25% was found in the respective sediments. The calculated loss of 137Cs per unit area was: eroded soils > croplands > grass > forest.--Copyright 1975, Biological Abstracts, Inc.
W76-11453

DOCUMENTATION FOR ES001. A STEADY-STATE, ONE DIMENSIONAL, ESTUARINE WATER QUALITY MODEL,
Environmental Protection Agency, New York. Region II.
S. C. Chapra, and S. Gordimer.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-246 847, $7.75 in paper copy, $3.00 in microfiche. Environmental Protection Agency Final Report No. ES001, September 1973. 224 p, 11 ref, append.

Descriptors: *Computer programs, *Estuaries, *Water quality, *Biochemical oxygen demand, *Dissolved oxygen, Mathematical models, Water resources, Resource development, Model studies.

ES001 is a computer program which can be used to simulate tidally averaged one dimensional steady-state estuarine systems and predict water mathematical model of an estuarine system. The basic approach used in ES001 is the law of conservation of mass. The model presented is specifically applied to the BOD-DO deficit system, however analogous systems of sequential reactions of two substances, or single systems under first order kinetics may also be modelled. ES001 is presently programmed for use on the IBM 370 while ES002 is compatible with an IBM 1130 system. ES001 is capable of modelling general one-dimensional estuarine systems for a variety of substance concentrations. The program requires segmentation of the system being modelled into sections within which the various geomorphological, physical and hydrological parameters of the estuary are constant. The sections are then connected mathematically, the junction points of these segments being boundary points where these parameters can change. Several types of junctions are allowed including triple junctions, dams, etc., which in combination allow the modelling of numerous types of configurations. The model is assumed to be at steady state and to be tidally averaged. Steady state means that the variables and parameters describing a system do not vary with time. Finally, reaction kinetics are assumed to be of the first-order for the reasons that many substances reacting in an estuary approximate this type of behavior. (Sinha - OEIS)
W76-11460

RANDOM MODEL OF EVAPORATION OF OIL AT SEA,
Mathematica, Inc., Philadelphia, Pa.
M. H. Fallah, and R. M. Stark.
The Science of the Total Environment, Vol 5, No 1, p 95-109, January 1976. 10 fig, 6 ref.

Descriptors: *Continental shelf, *Oil spills, *Oil pollution, *Resources development,

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*Environmental effects, *Water pollution sources, *Evaporation, Model studies.
Identifiers: *Outer Continental Shelf, Oil slicks.

When oil is spilled at sea, a portion of it evaporates. The amount depends upon the oil's physical properties and environmental conditions. This paper explores the effect of a random environment on the evaporation process. A random model is developed to predict the residual volume of oil as a function of elapsed time, initial oil volume and its physical properties, and random environmental factors (wind speed and ambient temperature). A simple example illustrates application of the model. Also, a simulation illustrates the effects of random wind speeds on the residual volume and area of the oil slick as a function of time. (Sinha - OEIS)
W76-11462

MODELING THE FATES OF METALS IN OCEAN-DISCHARGED WASTEWATERS,
Southern California Coastal Water Research Project, El Segundo.
T. J. Hendricks, and D. R. Young.
Southern California Coastal Water Research Project Report No. TM 208, Jan 1974. 32 p, 12 fig, 4 tab, 7 ref.

Descriptors: *Continental shelf, *California, *Waste disposal, *Metals, *Water pollution sources, *Waste water(Pollution), Coasts, Sediments, Water resources, Model studies, *Path of pollutants.
Identifiers: Outer Continental Shelf, *Ocean dumping.

Numerical models of the deposition of wastewater particulates and the mobilization of trace metals associated with the particulates were used to examine the fates of five metals (copper, zonc, chromium, lead, and cadmium) present in the submarine wastewater discharges of the Los Angeles County Sanitation Districts. The models predicted that the effluent-related deposition rates will exceed natural sedimentation rates for distances of up to 8 km from the outfalls and account for more than 80 percent of the variation in the metal concentrations observed in the sediments of this area. A discontinuity in the sediment metal distributions at about 3 km from the outfall was revealed by the models; this discontinuity was interpreted as the boundary between aerobic and anaerobic sediments and the position of a corresponding change in the metal mobilization rates. These predictions were compatible with earlier measurements of the physical, chemical, and biological characteristics of the sediments. The models also predicted that, although 90 percent of the metals discharged through the outfall system are associated with particulates, only 10 percent of the metals in the effluent would be retained in the nearby sediments. This prediction agreed with a budget estimated using a different technique. Most of the sewered wastewaters from the coastal regions of southern California are eventually discharged into the ocean. The major discharges, totaling approximately 1 billion gallons per day undergo a minimum of primary treatment prior to their introduction into the ocean through submerged outfalls terminating at a depth of about 200 feet. (Sinha - OEIS)
W76-11464

BUREAU OF LAND MANAGEMENT'S ENVIRONMENTAL STUDIES PROGRAM FOR THE SOUTH ATLANTIC OUTER CONTINENTAL SHELF AREA. CONFERENCE/WORKSHOP PROCEEDINGS,
Research Triangle Inst., Research Triangle Park, N. C.
For primary bibliographic entry see Field 6G.
W76-11474

SOUTHEAST COASTAL RESEARCH ACTIVITIES OF ERDA,
Division of Biomedical and Environmental Research (USERDA), Washington, D. C.
For primary bibliographic entry see Field 6G.
W76-11477

OFFSHORE OPERATIONS, REGULATION AND ENVIRONMENTAL PROTECTION,
Exxon Co., New Orleans, La. Southeastern Div.
For primary bibliographic entry see Field 6G.
W76-11480

OVERVIEW OF CONFERENCE PROGRAMS,
Skidaway Inst. of Oceanography, Savannah, Ga.
For primary bibliographic entry see Field 6G.
W76-11481

GEOLOGICAL OCEANOGRAPHY CONSIDERATIONS,
Duke University, Durham, N. C.
For primary bibliographic entry see Field 6G.
W76-11482

PHYSICAL OCEANOGRAPHY CONSIDERATIONS,
State Univ. System of Florida Inst. of Oceanography, St. Petersburg.
For primary bibliographic entry see Field 6G.
W76-11483

CONCLUSION AND RECOMMENDATIONS CONFERENCE/WORKSHOP,
Skidaway Inst. of Oceanography, Savannah, Ga.
For primary bibliographic entry see Field 6G.
W76-11485

TRANSVERSE DISPERSION IN PARTIALLY STRATIFIED TIDAL FLOW,
California Univ., Berkeley. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2L.
W76-11486

FEASIBILITY OF MODELLING THE INFLUENCES OF PIT RECHARGE ON GROUNDWATER LEVELS AND QUALITY IN ALLUVIAL BASINS,
Water Resources Research Center, Tucson.
For primary bibliographic entry see Field 2F.
W76-11487

NON-POINT SOURCE WATER QUALITY MONITORING, INYO NATIONAL FOREST, 1975,
California University, Los Angeles, Environmental Science and Engineering.
For primary bibliographic entry see Field 5A.
W76-11492

AN ENVIRONMENTAL ASSESSMENT OF IMPACTS OF COAL DEVELOPMENT ON THE WATER RESOURCES OF THE YAMPA RIVER BASIN, COLORADO AND WYOMING--PHASE-II WORK PLAN,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 5C.
W76-11500

THE PROBLEM OF MERCURY IN THE MEDITERRANEAN, (IN FRENCH),
Centre d'Etudes et de Recherches de Biologie et d'Oceanographie Medicale, Nice (France).
M. Aubert.
Rev Int Oceanogr Med. 37/38, p 215-231, 1975.

Descriptors: *Mercury, *Sediments, *Biomass, *Pollutant identification, *Path of pollutants, *Distribution patterns, Measurement, Water pollution effects
Identifiers: *Mediterranean Sea

Measurements of Hg in waters, sediments and biomass of the Mediterranean Sea and the geographic distribution of Hg as a function of origins and hydrobiologic mechanisms leading to that contamination are presented. From that data and some physiopathological considerations based on studies in other seas, the prospective dangers of Hg contamination to local fish eating populations are delineated.--Copyright 1975, Biological Abstracts, Inc
W76-11531

QUANTITATIVE CHARACTERISTICS OF DISTRIBUTION OF BDELLOVIBRIO BACTERIOVORUS IN RIVER WATER, (IN RUSSIAN),
Akademiya Nauk SSSR. Moscow. Inst of Biochemistry and Physiology of Microorganisms.
For primary bibliographic entry see Field 5A.
W76-11551

A STUDY OF THE QUALITY OF SILK REELING WATER IN REGARD TO SOLUBILITY OF COCOON-SERICIN, (IN JAPANESE),
Ministry of Agriculture and Forestry, Tokyo (Japan). Sericultural Experiment Station.
S. Bito.
Bull Seric Exp Stn (Tokyo). 25(6), p 371-583, 1973

Descriptors: *Water quality, *Cation exchange, Conductivity, River, Water wells, *Alkalinity, Hardness(Water), Industrial wastes, *Correlation analysis, Coagulation, *Regression analysis, Salts, Mixing, *Solubility.
Identifiers: Cocoon-sericin, Conductivity, *Japan, *Silk reeling water, Aluminum salts.

The silk reeling region in Japan was divided into 8 zones, the quality of the reeling water of mills, including the river and well water of the environment, was chemically investigated. The quality of water in the 8 zones was compared. Some characteristics of the river and well water (including alkalinity, electro conductivity and hardness) are enumerated. The solubility of cocoon-sericin was investigated in all reeling waters and abnormal quality zones identified. Correlation in factors of water quality was analyzed for rivers and wells in all zones. Correlation between the solubility of cocoon-sericin and other factors of water quality are drawn, and coefficients of correlation presented. Multiple regression analysis was attempted on the relation between the solubility of the cocoon-sericin and factors of water quality; alkalinity is the main contributing factor for the sericin solubility. Regression equations were set up to estimate sericin solubility with respect to alkalinity. Improvements on abnormal water vis-a-vis solubility of cocoon-sericin were examined; good results have been obtained toward regulation of solubility of the rough cation-exchange, coagulation by aluminum salts, and mixing with water of different alkalinity.--Copyright 1975, Biological Abstracts, Inc.
W76-11557

RADIOACTIVITY IN THE MEDITERRANEAN SEA, (IN ITALIAN),
Parma Univ. (Italy). Instituto di Zoologia.
For primary bibliographic entry see Field 5A.
W76-11558

MASS DESTRUCTION OF SYNTHLIBORAMPHUS ANTIQUUS BY OIL POLLUTION OF JAPAN SEA,
Niigata Prefecture (Japan). For. Div.
For primary bibliographic entry see Field 5C.
W76-11562

CONTAMINATION OF THE SEA, (IN SPANISH),
For primary bibliographic entry see Field 5C.
W76-11564

CHARACTERISTICS OF THE QUALITY OF IRRIGATION WATER ON THE BAGAEVSK-SADKOVSK IRRIGATION SYSTEM, (IN RUSSIAN),
Moscow State Univ. (USSR). Dept. of Soil Science.
A. G. Rozanov, and M. A. Abdel'Mottalib.
Pochvoved Nauki (Mosc) 18(1), p 114-118, 1975.

Descriptors: *Water quality, *Irrigation water, Drain, Irrigation systems, Evaporation, Sodium, Drainage, Potassium, Chlorides, Ions, Groundwater, Sulfates.
Identifiers: *USSR(Don River).

Drain, irrigation, drainage and ground waters and their evaporites of the Bagaevsk-Sadkovsk irrigation system supplied from the Tsymlyansk reservoir on the Don River in the Russian SFSR (USSR) were studied. As the water flows from the reservoir to the drainage outlet its composition changes considerably. The concentration of Na, Mg, Cl and sulfate ions changes as a result of evaporation and Ca and Mg ions as a result of interaction with the solid phase of the soils.--Copyright 1976, Biological Abstracts, Inc.
W76-11566

CERTAIN ASPECTS OF THE PROCESS OF ENTEROVIRUS INACTIVATION WITH CHLORINE, (IN RUSSIAN),
Institute of General and Municipal Hygiene, Moscow (USSR)
For primary bibliographic entry see Field 5F.
W76-11568

STUDY OF THE BEHAVIOUR OF POLIOMYELITIS VIRUS TYPE 1 IN DIFFERENT HYDROUS MEDIA, (IN FRENCH),
Metz Univ. (France).
For primary bibliographic entry see Field 5A.
W76-11569

POLLUTION IN THE EFFLUENTS OF BRACCIANO LAKE AND IN ARRONE STREAM, ON THE BASIS OF THE DISTRIBUTION OF SIMULIDAE, CHIRONOMIDAE, CULCIDAE AND OTHER DIPTERA, (IN ITALIAN),
Istituto Superiore di Sanita, Rome. (Italy). Laboratori di Parassitologa.
M. Di Delupis, M. Dojmi, L. Noccioli, L. Savosecchi, and M. Scanga.
Riv Parassitol 34(4), p 311-320, 1973.

Descriptors: *Diptera, Distribution, Effluents, Lakes, Streams, Biochemical oxygen demand, Nitrates, Ammonia, Oxygen, Water pollution effects, Bioindicators, Larvae.
Identifiers: Anopheles-Claviger, Arrone Stream(Italy), Bracciano, Culex-Pipiens, Culicidae, Orthocladinae, Pupae, Simuliidae, Simulium-Galeratum, Tanipidynae, Wilhelmia-Aureum, Wilhelmia-Latipes, Wilhelmia-Ornata, Italy(Bracciano Lake).

Collecting places (12) in effluents of Bracciano Lake and height collecting places in Arrone Stream (Italy) were examined for aquatic dipterous larvae, during 4 summer months. Various chemical and physical examinations were performed. The distribution in the 20 collecting places of larvae and pupae of Chironomidae (Chironominae, Tanipodynae, Orthocladinae), Culicidae (Culex pipiens, Anopheles claviger), Simuliidae (Wilhelmia latipes-group W. aureum-group, W. ornata-group, and Simulium galeratum) is reported. The summer values of biological oxygen demand (BOD5) saturated O2, NH3 and NO3 are presented. Aquatic larval Diptera, especially Simuliidae, Chironomidae and Culicidae, may be used as ecological indicators.--Copyright 1976, Biological Abstracts, Inc.
W76-11570

HYGIENIC PROBLEMS OF LARGE ANIMAL CONFINEMENT,
Universitaet Hohenheim (Landwirtschaftliche Hochschule). (West Germany). Animal Health Dept. (I).
For primary bibliographic entry see Field 5G.
W76-11571

PHYSICO-CHEMICAL PARAMETERS OF THE HYDROGRAPHIC SYSTEM OF LAKE NANTUA: RELATION WITH OSCILLATORIA, (IN FRENCH),
Station d'Hydrobiologie Continentale, Thonon-les-Bains (France).
For primary bibliographic entry see Field 5C.
W76-11575

THE APPLICATION OF 'BIOTIC INDICES' TO THE STUDY OF POLLUTION IN A RIVER WITH CYPRINIDAE, (IN FRENCH),
Station Bioligique des Eyzies (France).
For primary bibliographic entry see Field 5A.
W76-11580

THE DISTRIBUTION OF NUTRIENT SALTS IN THE MORLAIX BAY (FINISTERE, FRANCE): THE ROLE OF BENTHIC ALGAE, (IN FRENCH),
Brussels Univ. (Belgium). Lab. of Oceanography.
G. T. Houvenaghel.
Hydrobiologia 47(1), p 13-29, 1975.

Descriptors: *Algae, Bays, *Nutrients, *Salts, Benthos, Primary productivity, Salinity, Rivers, Silica, Dissolved solids, *Distribution, Path of pollutants.
Identifiers: *France(Morlaix Bay), English Channel.

A hydrologic profile of Morlaix Bay and River, carried out during the spring under favorable weather conditions, showed weak salinity gradients. The distribution of nutrient salts indicated the presence of 2 distinct zones: an estuarian zone, characterized by high production and large consumption of dissolved silica; and the bay zone, indicative of the activity of benthic macroscopic algae, which are responsible for 80% of the total consumption. Consumption levels suggested that water remained, at a minimum, 2 days in the estuary and 3 in the bay. Given the large volume of water required to maintain benthic and pelagic primary production, it is the English Channel that determines the biotic conditions of the bay.--Copyright 1976, Biological Abstracts, Inc.
W76-11583

LIPID COMPOSITION OF SURFACE FILMS, AND ZOOPLANKTON FROM THE EASTERN MEDITERRANEAN,
Institute of Oceanographic Sciences, Wormley (England).
R. J. Morris.
Marine Pollution Bulletin Vol. 5, No. 7, 1974. p. 105-109, 2 tab., 1 fig., 31 ref.

Descriptors: *Oily water, *Oil pollution, *Zooplankton, *Lipids, *Oil spills, Oil, Oil-water interfaces, Path of pollutants, Water analysis, Crustaceans, Fish, Surfaces, Films, Organic compounds.
Identifiers: *Mediterranean, *Petroleum hydrocarbons, *Tar balls, Tissue analysis, *Surface films, Biological concentration.

The natural surface films in the Eastern Mediterranean appear to be badly polluted with petroleum hydrocarbons, and sub-surface oil/water emulsions are also important contributors to the interface chemistry in certain areas. High levels of non-natural hydrocarbons are present in the lipids of some near-surface zooplankton from this region, suggesting that these animals store and concentrate the pollutant hydrocarbons. (Katz)
W76-11585

ORGANIC POLLUTION IN ENSENADA BAY, MEXICO,
Centre d' Oceanographie, Marseille (France). Station Marine d'Endoume.
M. L. Lizarraga-Partida.
Marine Pollution Bulletin Vol. 5, No. 7, 1974. p. 109-112. 2 tab., 2 fig., 6 ref.

Descriptors: Marine animals, *Benthos, *Organic wastes, *Annelids, *Domestic wastes, *Food processing industry, Organic loading, Industrial wastes, Molluscs, Gastropods, On-site investigations, Invertebrates, Bays, *Mexico, *California, Waste disposal, *Path of pollutants.
Identifiers: *Ensenada Bay(Mex), Baja(Calif), *Polychaetes.

Little attention has so far been paid to the effects of pollution on the Mexican coast. Pollution has become serious in a few industrial areas and attention is now being paid to the effect of discharging organic wastes into the sea at the important tourist center of Ensenada in Baja, California. As in other studies conducted at Los Angeles and Marseille, it has been found that the distribution of polychaete worms in the seabed is a valuable index of the state of health of the sea. (Katz)
W76-11587

PCB LEVELS IN CLYDE MARINE SEDIMENTS AND FAUNA,
Clyde River Purification Board, Glasgow (Scotland).
W. Halcrow, O. W. MacKay, and J. Bogan.
Marine Pollution Bulletin, Vol, 5, No. 9, 1974, p. 134-136, 2 tab., 3 fig., 11 ref.

Descriptors: *Polychlorinated biphenyls, *Sewage pollution, *Sediments, *Sluge disposal, *Sewage sluge, *Benthos, Water pollution effects, Bottom sediment, Benthic organisms, Pathology, Molluscs, Estuaries.
Identifiers: Sediment analysis, *Tissue analysis, *Chlorinated hydrocarbons, Buccinum, Nuccula, Chlamys, Glasgow, *Firth Clyde(Scotland).

Surveys in the dumping grounds for sewage from the City of Glasgow show accumulations of PCBs in superficial sediments, suggesting that significant quantities of these chlorinated hydrocarbons have been dumped for about 20 years with a marked increase about 10 years ago. The benthic fauna in the area is correspondingly contaminated. With restrictions on the manufacture of PCBs and the elimination of other sources in the catchment area, levels of contamination are expected to drop. (Katz)
W76-11589

FLUORIDE IN MARINE ANIMALS,
Newcastle-upon-Tyne Univ. (England). Dept. of Plant Biology.
For primary bibliographic entry see Field 5C.
W76-11593

WATER QUALITY MANAGEMENT PLANNING FOR URBAN RUNOFF.
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5D.
W76-11600

MERCURY IN LAUNDRY WASTEWATERS,
Illinois Inst. for Environmental Quality, Chicago.
For primary bibliographic entry see Field 5D.
W76-11602

LIBRARY U. OF I. URBANA-CHAMPAIGN

MODELING SOLUTE TRANSPORT IN GROUND WATER,
Geological Survey, Denver, Colo.
L. F. Konikow.
In: International Conference on Environmental Sensing and Assessment, Vol. 2, September 14-19, 1975, Las Vegas, Nevada, p 20-3-1 - 20-3-6. 7 fig, 18 ref.

Descriptors: *Model studies, *Groundwater, *Path of pollutants, *Solutes, *Industrial wastes, Flow, Ponds, Aquifers, Chlorides, Computer programs.
Identifiers: *Solute transport, Disposal ponds.

A computer model for simulating solute transport in flowing groundwater was developed by coupling a finite-difference solution to a groundwater flow equation with the solution to a solute-transport equation using the method of characteristics. The model accurately reproduced the observed 30-year history of contamination at the Rocky Mountain Arsenal in Colorado where liquid industrial wastes seeped out of unlined disposal ponds and spread for many square miles in an underlying alluvial aquifer. The model also integrated the effects of several factors that controlled changes in chloride concentrations. The model can thus predict the rates and directions of the spreading of conservative contaminants from known or projected sources when adequate hydrogeologic data are available. (See also W76-10637) (Kreager-FIRL)
W76-11605

AN IMPROVED MODEL FOR ANALYSIS OF AIR AND WATER POLLUTION DATA,
Environmental Protection Agency, Las Vegas, Nev. Office of Research and Development.
D. T. Mage, and W. R. Ott.
In: International Conference on Environmental Sensing and Assessment, Vol. 2, September 14-19, 1975, Las Vegas, Nevada, p 20-5-1 - 20-5-5. 5 fig, 2 tab, 13 ref.

Descriptors: *Model studies, *Water pollution, *Statistical models, *Mathematical models, *Diffusion, Ohio river, Rivers, Biochemical oxygen demand, Chemical oxygen demand, Coliforms, Chlorides, Sulfates, Analytical techniques.
Identifiers: Data analysis.

The role of univariate probability models in environmental data analysis is discussed, and an improved model for the analysis of air and water pollution data is presented. The improved model is based on a 3-parameter lognormal distribution and is proposed by considering diffusion processes, including sources and sinks, as stochastic phenomena. When the third parameter is negative, the model is censored at the third parameter; and when the third parameter is zero, a standard 2-parameter lognormal model results. The model was examined for 9 sets of water quality data obtained from the Ohio River including biochemical oxygen demand, chemical oxygen demand, coliforms, chloride, and sulfate. It showed considerable improvement over a standard 2-parameter lognormal distribution when parameters were estimated by the method of maximum likelihood. The model is recommended for general purpose analyses of environmental data. (See also W76-10637) (Kreager-FIRL)
W76-11606

FINE PARTICLES AND WATER QUALITY IN THE COASTAL MARINE ENVIRONMENT,
State Univ. of New York at Stony Brook. Marine Sciences Research Center.
J. R. Schubel.
In: International Conference on Environmental Sensing and Assessment, Vol. 2, September 14-19, 1975, Las Vegas, Nevada, p 34-2-1 - 34-2-11. 5 fig, 3 tab, 48 ref.

Descriptors: *Suspended solids, *Estuaries, *Organic compounds, *Water pollution effects, *Coasts, Aquatic life, Dissolved oxygen, Nutrients, Geology.

The effect of man's activities on the particulate matter loading and water quality of coastal marine environments is discussed. Inputs of naturally occurring particulate matter to the coastal environment are being increased by land-use practices, dam and reservoir construction, river diversion, and projects to control shore erosion. Anthropogenic particulate matter input is also increasing as well as the local production of organic material as a result of nutrient loading. The increased influxes of particulate matter are significantly reducing the geological lifetimes of many coastal embayments, particularly estuaries. High concentrations of fine-grained suspended matter are degrading some coastal systems to the extent that their useful biological and recreational lifetimes may be cut drastically shorter than their geological lifetimes. Suspended particulate matter is capable of affecting the distribution of dissolved oxygen, decreasing the production of oxygen by rooted aquatic plants, acting as both a source and sink for nutrients, and concentrating various water pollutants. Representative concentrations of total suspended matter are tabulated for various estuarine environments. (See also W76-10637) (Kreager-FIRL)
W76-11612

5C. Effects Of Pollution

THE MICROBIAL DEGRADATION OF OIL IN THE SEA,
University Coll., Cardiff (Wales). Dept. of Microbiology.
For primary bibliographic entry see Field 5B.
W76-11101

UTILIZATION OF STREAM-BORNE PHOSPHORUS BY CAYUGA LAKE PHYTOPLANKTON,
Cornell Univ., Ithaca, N. Y.
J. P. Barlow.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-256 209, $3.50 in paper copy, $3.00 in microfiche. Completion Report, July 1976, 18 p, 5 fig., 1 tab., 9 ref. OWRT A-064-NY(1). 14-34-0001-6033.

Descriptors: *Phosphorus, *Eutrophication, Nutrients, Algae, Lakes, *Phytoplankton, *New York, Water pollution effects, Seasonal, Streams, Absorption.
Identifiers: *Cayuga Lake(NY), Desorption.

The objective has been to determine seasonal and within season variations in both amounts and biological availability of phosphorus (P) discharged by Salmon Creek, one of the major tributaries to Cayuga Lake. The stream P was partitioned into soluble and particulate forms by filtration, and, in addition, P was desorbed from particles by mixing stream water with low P lake water. Availability of these assays showed that desorbable P was most readily utilized, followed closely by soluble P in stream water, but that very little of the particulate P was useable. There appear to be seasonal variations in relative availability, as well as variations within single runoff events. Although these results are still preliminary, it is clear that, since most of the stream P is associated with particles, the availability of this P must be taken into account when estimates of P loading are made.
W76-11108

IMPACT STATEMENT FOR THE AQUATIC PLANT-CONTROL PROGRAM-STATE OF TEXAS,
Army Engineer District, Galveston, Tex.
For primary bibliographic entry see Field 6G.
W76-11146

RELATIONSHIP BETWEEN WATER QUALITY AND PLANT GROWTH IN PONDS,
Rutgers, The State Univ., New Brunswick, N. J. Dept. of Soils and Crops.
D. N. Riemer, and B. J. Mottu.
Available from the National Technical Information Service, Springfield, Va 22161, as PB 256 513, $4.00 in paper copy, $3.00 in microfiche. New Jersey Water Resources Research Institute, New Brunswick. Completion Report, July 1976. 37 p, 15 fig, 11 tab, 1 ref. ONRI A-034-NJ(3), 14-31-0001-4030.

Descriptors: *Ponds, *Phytoplankton, *Water quality, *Carbon dioxide, *Nitrogen, *Phosphorus, Plants, Vegetation, Nutrients, Sediments, Anaerobic conditions, Oxygen, Eutrophication, Water pollution effects.

Phytoplankton growth, oxygen, nitrogen, phosphorus, carbon dioxide, and other parameters were measured in 12 ponds over a three year period. An unsuccessful attempt was made to increase the soluble phosphorus level of some of the ponds, apparently because the soluble phosphorus is an equilibrium value determined by conditions in the pond. Phytoplankton was generally at a maximum in late summer or early fall. Due to the occurrence of different vegetation types in different ponds, quantitative comparisons of growth among ponds could not be made. Maximum levels occurred during the winter and minimum levels occurred during the period of maximum phytoplankton growth. Soluble phosphorus was at a minimum during the winter and at a maximum during the summer. Carbon dioxide at the surface was depleted during periods of maximum phytoplankton growth but reached its maximum at the pond bottoms at the same time. The results indicate that nitrate, orthophosphate, and carbon dioxide levels fluctuate widely during the year and must be measured at specific times to obtain meaningful results. In the ponds studied, carbon dioxide production and release of phosphorus from insoluble forms appear to be the primary controlling factors in phytoplankton growth.
W76-11170

THE EFFECTS OF VARIATIONS IN TURBIDITY ON CYCLES OF PLANKTONIC AND BENTHIC ORGANISMS IN FLOOD CONTROL RESERVOIRS,
Mississippi Univ., Dept. of Biology.
Y. J. McGaha, J. W. Burris, and C. M. Cooper.
Available from the National Technical Information Service, Springfield, Va. 22161 as PB-256 55[illegible] $4.00 in paper copy, $3.00 in microfiche. Mississippi Water Resources Research Institute, Mississippi State, Completion Report, July 1976. 41 p, [illegible] tab, 28 ref, append. OWRT A-090-MISS(1).

Descriptors: *Turbidity, Biology, *Productivity, *Mississippi, *Plankton, Reservoirs, *Benthos, Flood control, Suspended solids, Water pollution effects, Cycles, Succession, *Grenada Reservoir(Miss).

The effects of turbidity on plankton and macrobenthos cycles in four northern Mississippi flood control reservoirs were studied. Turbidity measurements in part per million SiO2 were analyzed with other concomitant physiochemical data to ascertain the effects of suspended materials on planktonic and benthic cycles in the impoundments. A quantitative plankton analysis was made and 27 of the most abundant genera were entered in a computerized stepwise regression analysis against 20 predictor variables consisting of the physiochemical data. Significant correlation with respect to the turbidity variable was observed in 10 genera. A regression summary listing turbidity and other variables with significance above the .05 level is given for each of the 10 genera. Benthic organisms were analyzed separately and data were

ot computerized. An analysis of community egradation of benthos as a result of environmenl stress brought on by turbidity related henomena was undertaken. The main emphasis f the benthos study was in Grenada Reservoir, lississippi.
76-11172

ONG-TERM ACIDIFICATION OF A LAKE ND RESULTING EFFECTS ON FISHES,
isheries and Marine Service, Nanaimo (British olumbia). Biological Station.
J. Beamish, W. L. Lockart, J. C. van Loon, and . H. Harvey.
mbio, Vol. 4, No. 2, p. 98-102, 1975. 2 fig., 2 tab., ref.

escriptors: *Hydrogen ion concentration, Reproduction, *Biomass, *Fish diseases, thology, *Lake trout, *Burbot, *Suckers, kes, *Calcium, Environmental effects, Water ality, *Spawning, *Metabolism, *Productivity, sh populations, Size, Growth rates, On-site instigations, Pikes, *Acidic water, Acidity, Water llution, Oligotrophy, Dominant organisms.
entifiers: Sublethal effects, *George ke(Canada).

incident with an annual decrease in pH of orge Lake, at a rate of approximately 0.13 pH its per year, lake trout walleye, burbot, and all-mouth bass have disappeared. In 1973 rthern pike, rock bass, pumpkin-seed sunfish, own bullhead and white suckers did not roduce successfully. The size and population of ite suckers have decreased from 1967 to 1973 h a biomass in 1973 10 percent of that measured 1968. Spinal deformities first appeared in the ite sucker population in 1971 and increased to percent by the fall of 1972. This appears to be ated to a decrease in pH below 5.0. Abnormal ncentrations of calcium in the serum of white kers during the period of ovarian maturation s probably induced by low pH values and may related to the failure of fishes to spawn. (Katz)
6-11178

ASONAL MORTALITY OF RAINBOW OUT (SALMO GAIRDNERI) PLANTED IN ALLL EUTROPHIC LAKES OF CENTRAL NADA,
heries and Marine Service, Winnipeg anitoba). Freshwater Inst.
B. Ayles, J. G. I. Lark, J. Barica, and H. Kling.
rnal of the Fisheries Research Board of ada, Vol. 33, No. 4, pt. 1, p. 647-655, April, 6. 5 fig., 1 tab., 25 ref.

criptors: *Rainbow trout, *Fishkill, ssolved oxygen, *Mortality, *Seasonal, iculture, *Eutrophication, *Temperature, dation, *Mortality, Commercial fish, *Fish ning, *Productivity, Environmental effects, ut, Salmonids, Lakes, Ammonia, Bioassay, oratory tests, Cyanophyta, Hydrogen ion conration, water pollution effects.
ntifiers: Sublethal effects.

seasonal mortality pattern and the causes of mortality of planted rainbow trout (Salmo dneri) were studied in eight small eutrophic s in central Canada used for extensive culture. Two periods of mortality were ald. The first occurred in all lakes during the 60 days of residence in the lakes and resulted e mortality of 60-90% of the numbers of fish ked. The second period occurred in about 20% e lakes and was due to low oxygen levels folng the collapse of a bloom of Aphanizomenon aquae. Rainbow trout are close to their iological upper tolerance levels in these lakes. r possible causes of mortality were synerc effects between algal toxins, ammonia and erature and bird predation. (Katz)
-11179

THERMAL TOLERANCE OF STORED FUNDULUS HETEROCLITUS GAMETES: FERTILIZABILITY AND SURVIVAL OF EMBRYOS,
Texas A and M Univ., College Station. Dept. of Biology.
K. P. Kuchnow, and R. S. Foster, IV.
Journal of the Fisheries Research Board of Canada, Vol. 33, p. 676-680, 1976. 2 fig., 3 tab., 22 ref.

Descriptors: Reproduction, Laboratory tests, *Temperature, *Mortality, *Fish reproduction, *Fish eggs, *Embryonic growth stage, Breeding, Fish, Teleosts, Aquiculture, Fish management, *Thermal stress, *Thermal pollution, Fertilization, *Gametocides, Water pollution effects.
Identifiers: Gametes, *Fundulus heteroclitus.

Fundulus heteroclitus ova were tested for fertility after storage intervals between 6 and 96 hr over a temperature range of 0-30 C. Sperm were tested after storage intervals of 2 to 24 hr over a temperature range of 0-20 C. Ova retained fertility best at 10-14 C with fertilization rates of 93, 80, and 46% after 24, 48 and 72 hr, respectively. Sperm retained fertility best at 0-4 C, with fertilization rate of 85, 59, and 25% after 2, 4, and 6 hr, respectively. Sperm retained fertility for a shorter time than ova because of sperm activity initiated by stripping. Variation in mortality in stored ova could be attributed to temperature differences. No relation between sperm storage temperatures and embryo mortality was found. (Katz)
W76-11180

PETROLEUM COMPOUNDS IN THE MARINE FOOD WEB: SHORT-TERM EXPERIMENTS ON THE FATE OF NAPHTHALENE IN CALANUS,
Marine Biological Association of the United Kingdom, Plymouth (England). Plymouth Lab.
E. D. S. Corner, R. P. Harris, C. C. Kilvington, and S. C. M. O'Hara.
Journal of the Marine Biological Association of the United Kingdom, Vol. 56, p. 121-133, 1976. 3 fig., 5 tab., 18 ref.

Descriptors: *Organic compounds, *Bioassay, *Absorption, *Path of pollutants, *Food webs, *Food chains, *Tracers, *Zooplankton, *Oil wastes, Metabolism, Methodology, Radioactivity, Laboratory tests, Crustaceans.
Identifiers: Naphthalene, Depuration, *Calanus sp., Bioaccumulation.

Adult female Calanus helgolandicus immersed for 24 hours in sea-water solutions of radioactively marked naphthalene accumulated a detectable quantity (3.6 pg/animal) from concentrations as low as 0.10 micrograms/1. Feeding experiments showed that the dietary route of entry was more important quantitatively than direct uptake from solution in that in order to ensure that the same quantity of radioactivity in the animals was attained by the two routes the level of hydrocarbon in solution had to be far greater than that present in particulate food. Depuration was much more rapid in organisms accumulating naphthalene from solution in sea water as compared to uptake through food sources. Only 5% of the original radioactivity remained after 10 days in the former case and about one third of the original radioactivity was detected after 10 days in the latter group. Short-term experiments determined that Calanus was able to metabolize naphthalene. (Katz)
W76-11181

UPTAKE PATHWAYS AND ELIMINATION OF A NONIONIC SURFACTANT IN COD (GADUS MORRHUA L.),
Kristinbergs Zoologiska Station (Sweden).
A. Granmo, and S. Kollberg.
Water Research, Vol. 10, p. 189-194, 1976. 4 fig., 2 tab., 23 ref.

Descriptors: *Absorption, *Surfactants, *Adsorption, *Mode of action, *Toxicity, *Temperature, *Oxygen, Laboratory tests, Water pollution effects, Methodology, Seasonal.
Identifiers: Gadus morhua, Tissue analysis, *Cod, Elimination, Bioaccumulation, Gills, Sub-lethal effects, Honylphonol cthoxylate.

The uptake and elimination of a labelled surfactant, the nonionic nonylphenol ethoxylate, was studied in cod (Gadus morrhua) exposed to a concentration of 5 ppm. The amount of labelled surfactant was analyzed by the scintillation counting method in various tissues from the fish. A penetration through the gills, and some intestinal resorption was found. Eight hours from start a steady state condition was obtained. High concentrations were found especially in gall bladder and liver. The elimination process in clean sea water was rapid and was evident after 24 hr. (Katz)
W76-11182

AN ASSESSMENT OF THE BASIS OF MERCURY TOLERANCE IN DUNALIELLA TERTIOLECTA,
Marine Biological Association of the United Kingdom, Plymouth (England). Plymouth Lab.
A. G. Davies.
Journal of the Marine Biological Association of the United Kingdom Vol. 56, p. 39-57, 1976. 6 fig., 3 tab., 38 ref.

Descriptors: *Toxicity, *Growth rates, *Bioassay, *Cytological studies, *Morphology, *Phytoplankton, Resistance, Laboratory tests, Heavy metals, Path of pollutants, Toxicants, Biochemistry, Metabolism, Amino acids, Potassium, *Mercury.
Identifiers: *Dunaliella sp., *Detoxication.

The specific growth rate of Dunaliella tertiolecta was unaffected by mercury II concentrations of at least 2.03 micrograms at/1 and a final level of cell material 13% below that of the control was obtained after exposure to 10 micrograms at/1. Growth was largely uncoupled from division and giant cells were produced, probably due to the effect of mercury upon the production of methionine which is associated with the process of cell division. Mercury tolerance was investigated in terms of (1) mercury detoxication in the culture medium by complex or compound formation between the metal and cellular metabolites, (2) the concentration of sulphydryl groups within the cell as sequestration sites, (3) the absence of cellular potassium leakage and (4) the resistance of the cell membrane to the uptake of mercury II ions. Results indicated that the mercury tolerance of D. tertiolecta is partly related to the slow rate of mercury accumulation by this species, but is largely due to the detoxification of the mercury within the cell, possibly by the precipitation of a highly insoluble mercury compound. (Katz)
W76-11183

CADMIUM UPTAKE BY MARINE FISH LARVAE,
Bundesforschungsanstalt fuer Fischerei, Hamburg (West Germany). Institut fuer Kuesten- und Binnenfischerei.
V. Dethlefsen, H. von Westernhagen, and A. Rosenthal.
Helgolander wissenschaftliche Meeresuntersuchungen, Vol. 27, p. 396-407, 1975. 6 fig., 30 ref.

Descriptors: *Larval growth stage, *Absorption, *Herrings, Marine fish, *Cadmium, Path of pollutants, *Metals, *Fish eggs, *Bioassay, Public Health, Laboratory tests, Fish, Heavy metals, Pathology, Analytical techniques, Spectrophotometry, Toxicants, Water pollution effects, Pollutant identification.
Identifiers: Bioaccumulation, *Platichthys sp., *Belone sp., *Flounder, Sublethal effects.

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Eggs of herring (Clupea harengus), flounder (Platichthys flesus) and garpike (Belone belone) were incubated in cadmium contaminated water (0.05-5.0 ppm) and newly hatched larvae were analysed for cadmium contents. Cadmium residues in newly hatched larvae were dependent on cadmium concentrations during incubation. Newly hatched flounder and herring larvae contained two orders of magnitude more cadmium than Belone belone larvae (0.7-2.3 nannograms Cd/0.1 mg dry weight and 0.0017-0.0185 nannograms Cd/0.1 mg dry weight respectively). Cadmium content of herring and flounder larvae held in cadmium contaminated water increased with exposure time. Herring larvae accumulated more cadmium than flounder larvae held in the same conditions. (Katz)
W76-11184

THE BALTIC SEA POLLUTION,
Morski Instytut Rybacki, Gdynia (Poland).
L. Zmudzinski.
Polskie Archiwum Hydrobiologii, Vol. 22, No. 4, p. 601-614, 1975. 6 fig., 9 tab., 17 ref.

Descriptors: *Organic compounds, Water pollution effects, *Eutrophication, *Bioindicators, *Biodegradation, *Nutrients, *Primary productivity, On-site data collections, Water quality, *Phytoplankton, Benthos, *Biomass, Commercial fish, *Pesticide residues, Crustaceans, Invertebrates, Sediments, Phosphates, Reproduction, Water pollution sources, Environmental effects, Degradation(Decomposition), DDT, Oil pollution.
Identifiers: *Baltic Sea, *Flavobacterium.

Between 1971-1973 complex studies on the Baltic Sea pollution were carried out giving special attention to the problems of eutrophication and contamination with hydrocarbons. Eutrophication has been observed in the Baltic Sea during the last 40 years as evidence by an increase in the concentration of nutrients in the sea water, and by a growing number of invertebrates and a higher yield of fish. A total area of 60-80 thousand square km has been devastated by eutrophication in the Baltic Sea. Some species of crustaceans are the most sensitive bioindicators of hydrocarbons in the water of the Baltic Sea while benthic fishes belong to the least sensitive organisms. In the biodegradation of hydrocarbons bacteria of the Flavobacterium genus show the highest activity. Their activity decreases with a decrease in temperature and an increase in the hydrocarbons concentration in the Baltic Sea waters. (Katz)
W76-11185

EFFECTS OF BISULFITE ON METABOLIC DEVELOPMENT IN SYNCHRONOUS CHLORELLA PYRENOIDOSA,
British Columbia Univ., Vancouver. Dept. of Plant Science.
G. Das, and V. C. Runeckles.
Environmental Research, Vol. 7, p. 353-362, 1974. 2 tab., 5 fig., 24 ref.

Descriptors: *Nutrients, Environmental effects, *Algae, Laboratory tests, *Growth rates, Sulfates, *Primary productivity, *Plant growth, *Sulfur compounds, *Toxicity, *Metabolism, Plant physiology, Photosynthesis, Productivity, Plant pathology, Inhibitors, Copper, Magnesium, Sodium, Calcium, Potassium.
Identifiers: *Chlorella pyrenoidosa, *DNA, *Sulfites, *Bisulfite, RNA.

Addition of bisulfite to synchronous cultures of Chlorella pyrenoidosa adversely affects both active growth and cell propagation. Biochemical analysis after treatment showed a differential change in the levels of chlorophylls, protein, RNA and DNA, when expressed as percentages of the cell dry weight: the content of chlorophyll 'b' increased, whereas that of chlorophyll 'a' decreased gradually with increases in HSO3-. The amounts of protein and RNA per unit dry weight remained constant, but DNA levels were markedly reduced. With the exception of iron, the levels of nutrient elements within the cells increased with increasing HSO3- concentration. The relative increases were most marked with K, Mg, Ca, Cu and Na. This suggests that HSO3- adversely affects cell development by impairing DNA synthesis. (Katz)
W76-11187

THE TOXICITY OF THE HERBICIDE DICHLOBENIL TO GOLDFISH (CARASSIUS AURATUS),
Utrecht Rijksuniversiteit (Netherlands). Inst. of Veterinary Pharmacology and Biological Toxicology.
G. Bolier, H. L. Van Der Maas, and R. Bootsma.
Meded Fac Landbouwwet Rijksuniv Gent. 38(3); p 733-740, 1973.

Descriptors: *Toxicity, Water pollution effects, Pesticide residues, Herbicides, Lethal limit, Pollutant identification.
Identifiers: Carassius-Auratus, *Dichlobenil, *Goldfish.

Goldfish were treated for 3 mo. with the herbicide at different dose levels and residues were determined. None of the fish died during the test. Body weight was decreased and the behavior of the animals was abnormal only at the highest concentration (6.4 mg/l) tested. Swimming was with jerky movements and respiration was quick and irregular. This group also had a higher number of granulocytes and less lymphocytes than fish tested at lower pesticide concentrations. No liver lesions were observed. The no toxic effect level for goldfish and continuous exposure during 3 mo. may be given as between 0.4 and 1.6 mg/l in water. The corresponding no toxic effect residue in the whole fish is between 8 and 29 ppm. For use as an herbicide in water, dichlorobenil should be applied at an estimated concentration of 1 mg/l. This recommended dosage does not appear to be a risk to fish life, but it should be noted that reproductive aspects were not covered in this study.--Copyright 1974, Biological Abstracts, Inc.
W76-11188

EFFECTS, UPTAKE AND METABOLISM OF METHOXYCHLOR, MIREX, AND 2,4-D IN SEAWEEDS,
Syracuse Univ., Research Corp., N. Y.
H. C. Sikka, G. L. Butler, and C. P. Rice.
Environmental Protection Agency, Report EPA-600/3-76-048, June 1976. 40 p., 12 tab., 41 ref.

Descriptors: *Pesticides, *Insecticides, *Chlorinated hydrocarbon pesticides, Aquatic plants, *Algae, *Herbicides, *2,4-D, Marine algae, Physiology(Plant), Biochemistry, Laboratory procedures, Carbohydrates, Environmental effects, Degradation(Decomposition), Metabolism, Photosynthesis, Proteins, Laboratory analysis, Lipids, Chlorophyll, Carbon radioisotopes.
Identifiers: *Methoxychlor, *Mirex, Ulva, Enteromorpha, Rhodymenia, Trace metals, Metabolism.

Results are presented of a study concerning effects, uptake, and metabolism of mirex, methoxychlor, and 2,4-D in the seaweeds Ulva sp., Enteromorpha sp., and Rhodymenia sp. None of the pesticides, at concentrations corresponding to their maximum solubility in seawater, had any significant effect on photosynthesis, protein, carbohydrate, lipid, chlorophyll, carotenoid or trace metal content of the algae. All three algae removed substantial amounts of mirex and methoxychlor from the medium, but uptake of 2,4-D was extremely low. The rate of uptake of methoxychlor was considerably greater than that of mirex. Enteromorpha accumulated considerably more mirex and methoxychlor than Ulva or Rhodymenia. Both Ulva and Enteromorpha failed to metabolize either mirex or 2,4-D. Enteromorpha metabolized methoxychlor to a limited extent. After 7 days of incubation with carbon labelled methoxychlor, a major portion of the label in the tissue and medium was present in unchanged methoxychlor. A small amount of radioactive metabolite, 2,2-bis (p-methoxyphenyl) 1,1-dichloroethylene, was detected in both the tissue and medium. In addition, medium contained 2,2-bis (p-hydroxyphenyl) 1,1,1, 1-trichloroethane and four unidentified minor radioactive metabolites. Unlike Enteromorpha, Ulva did not metabolize methoxychlor. (Katz)
W76-11189

EFFECTS OF SULFUR DIOXIDE AND/OR OZONE ON SEVERAL OAT VARIETIES, 1975 ANNUAL REPORT,
North Carolina State Univ., Raleigh
W. W. Heck, and J. A. Dunning
Environmental Protection Agency, Report EPA-600/3-76-032, March, 1976, 73 p., 64 tab., 5 ref.

Descriptors: *Sulfur compounds, Air-water interfaces, *Environmental effects, *Toxicity, *Oats, *Cereal crops, Oxygen, Physiology(Plant), Mortality, Field crops, Statistical analysis, Methodology, Growth rates, *Ozone, Plant growth, Grains(Crop).
Identifiers: *Sulfur dioxide.

Nine experimental designs were run to determine the effect of sulfur dioxide on the important Southeastern oat variety - Carolee. The designs were run under controlled conditions and looked at sulfur dioxide concentration (25-300 pphm), ozone interactions, growth and exposure temperatures, growth and exposure humidities, growth and exposure light intensities, nutrient sulfur levels, number of exposures and exposure ages, and a screen for growth conditions. Plants were grown to from 28 days to 84 days before final harvest. Top dry wt, root dry wt, number of tillers and injury were determined for all experimental designs except No. 5 and No. 8. The fifth design also included yield measurements and the eighth did not include the biomass data. The 75 pphm treatments for 1.5 hrs were close to a threshold dose. Growth environmental factors affected the response of the plants and in some cases exposure conditions caused an effect. Sulfur nutrition was a signification factor and showed an interaction with SO2 concentration on several response measures. Foliar injury was highly correlated with growth reductions. Several designs studied the effects of ozone alone (No. 6, 7, 8) or in combination with sulfur dioxide (No. 13). Two designs utilized 2 additional oat varieties, Salem and Coker 227 (No. 8, 9). (Katz)
W76-11190

TEMPERATURE, INFECTIOUS DISEASES, AND THE IMMUNE RESPONSE IN SALMONID FISH,
Oregon State Univ., Corvallis. Dept. of Microbiology.
J. L. Fryer, K. S. Pilcher, J. E. Sanders, J. S. Rohover,, and J. L. Zinn.
Environmental Protection Agency, Report EPA 600/3-76-021, April, 1976, 72 p., 16 tab., 8 fig., 9 ref.

Descriptors: Freshwater fish, *Salmon, +Mortality, *Water pollution effects, *Trout, Commercial fish, Temperature, *Water temperature, Heated water, Environmental effects, *Thermal stress, Laboratory animals, Animal diseases, Epizootiology, Rainbow trout, *Fish diseases, *Thermal pollution.
Identifiers: *Infectious diseases(Fish), Immune responses, Steelhead trout, Aeromonas salmonicida, Aeromonas liquefaciens, Mortality rates, Antibodies.

Investigations of the effect of temperature on infections of salmonid fish were conducted. Aeromonas salmonicida infection was studied in chinook salmon and steelhead trout; Aeromonas

efaciens infection was studied in chinook and o salmon. In all cases mortality rates were high 4 to 69 F; usually moderate at 54 to 59 F; and or zero at 39 to 49F. Progress of the infections accelerated at higher temperatures and re- ed at lower temperatures. Bacterial kidney dis- was studied in coho salmon and steelhead t. The temperature range of 44 to 54F was op- l for the development of fatal infection as in- ted by mortality rates of 78 to 100%. Higher peratures had a suppressing effect, which was ked at 69F. Temperatures of 59 to 69F were mal for the formation of agglutinating antibody n juvenile coho salmon were injected with a d suspension of A. salmonicida. At lower tem- tures less antibody was formed and no signifi- amount was produced at 39F 60 days after in- on of antigen. Oral immunization of juvenile salmon with a vaccine consisting of formalin d Vibrio anguillarum cells incorporated in diet protected them against fatal infection n the fish were held at temperatures ffom 39 to during immunization. (Katz)
-11191

BICIDE TOXICITY IN MANGROVES,
ni Univ., Coral Gables, Fla.
Teas.
ronmental Protection Agency, Report EPA- -76-004, March, 1976, 34 p., 13 tab., 1 fig., 32

riptors: *Herbicides, *2,4-D, *Mangrove ips, *Radioisotopes, *Toxicity, Mortality, assay, *Florida, Chlorine radioisotopes, Car- radioisotopes, Plant growth, Metabolism, tal marshes, Plant physiology, *Pesticide tox- *Lethal limit.
ifiers: *Picloram, *Mangroves, Red man- , Rhizophora mangle, White mangrove, ncularia racemosa, Black mangrove, Avicen- rminans, Radiochloride, Tolerance doses.

mine salts of 2,4-D and picloram were ap- to the Florida species of mangroves: red rove (Rhizophora mangle), white mangrove ncularia racemosa) and black mangrove ennia germinans). Treatments were to soil or by aerial spray and to single leaves as ts. The effects on radiochloride uptake and calization of radio-carbon-labelled picloram leaf application were studied in red man- 'Lethal doses' for young seedlings were 2.7 for white mangrove, 13 kg/ha for red and 13 for black; for mature plants they were 2.7, > 53 kg/ha, respectively. 'Tolerance doses' ung seedlings were 0.01, 5.3, and 5.3 kg/ha; ture plants they were 0.5, 5.3 and 53 kg/ha. ffect doses' for seedlings were < 0.01 kg/ha spcies; for mature plants they were < 0.1, d 2.7 kg/ha. Spray applications of 6.3 - 12.2 of commercial mixture to the canopy of a -species forest caused partial defoliation three weeks. Within 16 months it killed all white, 78-100% of the mature red, but none mature black mangroves. Radiocarbon- d picloram concentrated in dormant buds of ngrove and it is concluded that the tree is by the mixture because of its effects on Katz)
1192

E TOXICITY OF CERTAIN PESTICIDES ARTIA TONSA DANA,
on Labs. America, Inc., Vienna, Va.
hattar, and S. Farley.
nmental Protection Agency, Report EPA 6-033, May, 1976, 29 p., 9 tab., 2 fig., 38 ref.

tors: *Toxicity, *Bioassay, Laboratory s, *Marine animals, Pesticides, ophosphorous pesticides, *Chlorinated arbon pesticides, Crustaceans, *Diazonin, ology, Marine algae, *Pesticide toxicity, ods, Water pollution effects, Reviews.

Identifiers: Calanoid copepods, *Acartia tonsa, Residue analysis, *Methylparathion, *Azodrin, *Toxaphene, Acute toxicity, LC-50.

The acute toxicity to the marine copepod Acartia tonsa Dana of four technical grade insecticides was determined by bioassay using standardized procedures, homogeneous populations and constant laboratory conditions. At a water temperature of 17 + or - 1 deg. C, the 96-hour median lethal concentrations or tolerance limits for methy parathion, Azodrin, diazinon and toxaphene were computed as 0.89 milligrams per liter, 0.24 milligrams per liter, 2.57 micrograms per liter and 7.2 nanograms per liter, respectively. Residue analysis of diazinon at zero and 96-hour exposure time revealed that the mounts of diazinon uptake by three algal organisms are greater than amounts concentrated by the copepod. The toxicity of higher concentrations above 2.0 ppm (2 milligrams per liter) has offset copepod uptake, while at lower concentrations, quantities concentrated by Acartia are negligible. (Katz)
W76-11193

TEMPERATURE EFFECTS OF YOUNG YELLOW PERCH, PERCA FLAVESCENS (MITCHILL),
Environmental Research Lab., Duluth, Minn.
J. H. Mc Cormick.
Environmental Protection Agency, Report EPA-600/3-76-057, May, 1976, 19 p, 2 fig., 31 ref., 1 tab.

Descriptors: *Freshwater fish, *Yellow perch, *Commercial fish, *Juvenile fish, *Mortality, Water pollution effects, Temperature, *Water temperature, Heated water, Environmental effects, *Thermal stress, Growth, Bioassay, Laboratory animals, *Thermal pollution, Juvenile growth stages, Growth rates.

The effect of temperature on growth of young-of-the-year perch was determined over an 8-week period at constant temperatures from 8 deg. to 34 deg C. Absolute growth rate peaked at 28 deg C, but were not significantly less ($P > 0.5$) over the range from 26 deg. to 30 deg. C. Deformities occurred at 32 deg. C but at no lower temperatures, and all fish died within 7 days at 34 deg. C. A suggested seasonal temperature cycle for yellow perch habitats is presented, based on the data from this experiment for the summer period of rapid growth and on data from previous studies for other life stages. (Katz)
W76-11194

STUDIES ON THE SUSCEPTIBILITY OF ANKISTRODESMUS SPECIES TO CRUDE OIL COMPONENTS,
P. B. Kauss, and T. C. Hutchinson.
Verhandlungen International Vereinigung Limnologie, Vol. 19, p. 2155-2164, November, 1975. 8 fig., 1 tab., 15 ref.

Descriptors: *Aqueous solutions, *Productivity, *Inhibitors, *Bioassay, *Algae, *Growth rates, Oil, *Oil spills, *Plant growth, Laboratory tests, Methodology, Primary productivity, Separation techniques, Water pollution sources, Water pollution effects, Environmental effects.
Identifiers: *Ankistrodesmus sp.

Eight species and varieties of Ankistrodesmus, a green alga, were exposed to water soluble crude oil extract to determine variations in the effect of crude oil on algae. The water soluble compounds caused responses varying from growth stimulation to growth inhibition within and among the species. Cells of A. amalloides, A. braunii, A. falcatus var. acicularis, A. nanoselene and A. falcatus var. duplex exhibited a lag phase of 1 to 2 days when exposed to the oil extract. After this period, normal growth resumed. Reduced growth rate was observed in A. nanoselene from day 2 to 10. A. falcatus var. duplex showed a greater rate of growth after the initial lag. Extrapolation of laboratory bioassay data to predict the effects of an actual field spill is difficult due to the effects of evaporation, biodegradation and effects of nonsoluble portions. (Katz)
W76-11195

PROCEEDINGS, SEVENTEENTH CONFERENCE ON GREAT LAKES RESEARCH, PART 1.
For primary bibliographic entry see Field 2H.
W76-11275

THE CRUSTACEAN ZOOPLANKTON OF GREEN BAY, LAKE MICHIGAN,
Wisconsin Univ., Milwaukee. Center for Great Lakes Studies.
For primary bibliographic entry see Field 2H.
W76-11278

DIELDRIN AND DDT: ACCUMULATION FROM WATER AND FOOD BY LAKE TROUT (SALVELINUS NAMAYCUSH) IN THE LABORATORY,
Bureau of Commercial Fisheries, Ann Arbor, Mich. Great Lakes Fishery Lab.
R. E. Reinert, L. J. Stone, and H. L. Bergman.
In: Proceedings, Seventeenth Conference on Great Lakes Research, Part 1; McMaster University, Hamilton (Ontario), August 12-14, 1974. International Association for Great Lakes Research, p 52-58, 1974. 2 tab, 4 ref.

Descriptors: *Dieldrin, *DDT, *Lake trout, *Lake Michigan, Insecticides, Pesticides, Pollutants, Fish, Trout, Laboratory tests, Biology, Path of pollutants, Water pollution, Chlorinated hydrocarbon pesticides, Organic pesticides, Halogenated pesticides.
Identifiers: *Accumulation of insecticides.

In the laboratory the amounts of dieldrin and p,p'DDT accumulated by fish from contaminated water and food were measured to determine how fish from Lake Michigan accumulate high concentrations of these insecticides from an environment where the concentrations in water are generally less than 0.01 ppb. Eight groups of yearling lake trout (Salvelinus namaycush) were exposed to different combinations of dieldrin and p,p'DDT in water and food. Concentrations of dieldrin and p,p'DDT ranged from 0.006 to 0.010 ppb in water and from 1,700 to 2,300 ppb in food (Oregon moist pellets). After 152 days of exposure to insecticides in water, fish had accumulated an average of 478 ppb dieldrin or 352 ppb p,p'DDT. Fish exposed to dieldrin and p,p'DDT in food accumulated 470 and 648 ppb, respectively. However, it was difficult to determine exactly how much of either insecticide was accumulated from the food because trace amounts (0.003-0.004 ppb) had leached from food or feces. After exposure to the insecticide was terminated, fish eliminated dieldrin at a much faster rate than p,p'DDT. In fish exposed to a combination of dieldrin and p,p'DDT in water and then held for 125 days in uncontaminated water, the total amount of dieldrin declined 89%, but the total amount of p,p'DDT remained unchanged. Data from this study were used to estimate how much p,p'DDT adult Lake Michigan coho salmon (Oncorhynchus kisutch) accumulated from water and from food during a 104-day period (May-August 1968). The estimates suggested that during these months coho salmon accumulated most of the body burden of p,p'DDT from food. (See also W76-11275) (Sims-ISWS)
W76-11279

LABORATORY ESTIMATES OF THE SEASONAL FINAL TEMPERATURE PREFERENDA OF SOME LAKE ERIE FISH,
Ohio State Univ., Put-in-Bay. Center for Lake Erie Area Research.
For primary bibliographic entry see Field 2H.
W76-11280

UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN

MIGRATORY BEHAVIOR OF FISH TAGGED AT A NUCLEAR POWER PLANT DISCHARGE INTO LAKE MICHIGAN,
Argonne National Lab., Ill. Radiological and Environmental Research Div.
For primary bibliographic entry see Field 2H.
W76-11281

STORM INDUCED RELATIONSHIPS AMONG CHEMICAL CONDITIONS AND PHYTOPLANKTON IN SAGINAW BAY AND WESTERN LAKE HURON,
Michigan Univ., Ann Arbor. Great Lakes Research Div.
C. L. Schelske, L. E. Feldt, M. A. Simmons, and E. F. Stoermer.
In: Proceedings, Seventeenth Conference on Great Lakes Research, Part 1; McMaster University, Hamilton (Ontario), August 12-14, 1974. International Association for Great Lakes Research, p 78-91, 1974. 5 fig, 6 tab, 7 ref. ERDA C00-2003-23, NSF GA-4507.

Descriptors: *Phytoplankton, *Chemical, *Nutrients, *Lake Huron, * Storms, Sampling, Surveys, Temperature, Hydrogen ion concentration, Chlorides, Turbidity, Chlorophyll, Nitrates, Phosphorus, Silica, Water pollution, Correlation analysis, Chemistry, Biology.
Identifiers: *Saginaw Bay(Mich).

More than 50 stations were sampled in September 1972 to assess environmental conditions in western Lake Huron. Nine transects were sampled, including three south of Saginaw Bay, three north of Saginaw Bay, two in Saginaw Bay and one in the Straits of Mackinac. Chemical and biological characteristics of the stations in Saginaw Bay were markedly different than the other stations sampled: total phosphorus, silica, chloride, chlorophyll a and rates of carbon fixation were larger while nitrate was smaller. Although changes were small, silica, nitrate nitrogen increased and chloride decreased from north to south at the open lake stations. Phytoplankton standing crop were larger in Saginaw Bay than at open-lake stations and tended to decrease with distance from shore on the transects. Average cell counts (4000 cells/ml) in Saginaw Bay were an order of magnitude larger than at the open lake stations. In Saginaw Bay, Anabaena subcylindrica Borge was the dominant form with smaller numbers of Fragilaria capucina Desm. and Melosira granulata (Ehr.) Ralfs. None of these species was dominant at other locations except at a few nearshore stations and at stations near Saginaw Bay. North of Saginaw Bay the phytoplankton assemblage was dominated by eight species of diatoms and small numbers of unidentified flagellates. The abundance of A. subcylindrica populations at stations in and adjacent to Saginaw Bay was related to chloride centration. Silica and chlorophyll a concentrations also behaved as conservative elements at these stations. These data suggest that short-term mixing of Saginaw Bay and open-lake water resulted from strong winds that preceded the sampling. (See also W76-11275) (Sims - ISWS)
W76-11282

CHANGES IN PHYTOPLANKTON FOLLOWING NITRATE PHOSPHATE ADDITIONS TO LARGE ENCLOSURES IN MARION LAKE, BRITISH COLUMBIA,
Ottawa Univ. (Ontario). Dept. of Biology.
M. Dickman.
Schweiz Z Hydrol. 35(1); p 114-120, 1973.

Descriptors: Phytoplankton, Canada, *Nitrate, *Phosphates, Lakes, Water pollution effects, Detergents, Primary productivity.
Identifiers: British-Columbia, *Nitrate phosphate, *Marion Lake (B.C.)

The addition of nitrate, phosphate and a nitrate phosphate combination to replicated wooden enclosures in Marion Lake (Canada) resulted in significant increases in primary productivity and algal standing crop in each of the 3 types of treated enclosures. No single nutrient is likely to simultaneously limit the growth of all phytoplankton species present at any one time in the lake epilimnion. The relevance of this to the detergent controversy is discussed.--Copyright 1974, Biological Abstracts, Inc.
W76-11283

MODELING OF PHYTOPLANKTON IN LAKE ONTARIO,
Manhattan Coll., Bronx, N. Y. Environmental Engineering and Science
R. V. Thomann, R. P. Winfield, and D. M. DiToro
In: Proceedings, Seventeenth Conference on Great Lakes Research, Part 1; McMaster University, Hamilton (Ontario), August 12-14, 1974. International Association for Great Lakes Research, p 135-149, 1974. 12 fig, 2 tab, 13 ref. EPA R800610

Descriptors: *Model studies, *Phytoplankton, *Lake Ontario, *Great Lakes, Mathematical models, Nutrients, Pollutants, Nitrogen, Phosphorus, Carbon, Water pollution, Temperature, Chlorophyll, Biomass, Eutrophication, Epilimnion, Hypolimnion, Biology, Limnology.
Identifiers: *International Field Year for the Great Lakes.

A mathematical model of phytoplankton dynamics in Lake Ontario was developed and compared to observed data. The model is a horizontally well mixed representation of the lake with induced vertical mixing and stratification generating the epilimnion and hypolimnion. A third layer is included to represent the sediment. Phytoplankton chlorophyll, herbivorous and carnivorous zooplankton carbon, three nitrogen forms and two phosphorus forms are the primary dependent variables. Non-linear kinetics and interactions are used throughout to represent such phenomena as nutrient uptake, predation, recycling, and excretion products. Under reasonable sets of model parameters as reported in the literature and used in previous applications of the theory, the model output compared favorably with observed data on the dependent variables. Spring growth and peak chlorophyll concentrations are related primarily to increasing light and temperature. The model indicated that growth ceases due to phosphorus limitation. Zooplankton grazing and subsequent recycling of nutrients due to excretion and plankton respiration result in a late summer increase in phytoplankton biomass. Both nitrogen and phosphorus are then limiting resulting in a broad fall peak in phytoplankton biomass. A decline then results from low temperature due to fall overturn. The model indicated a response time of from 8 to 16 yrs before a decrease in nutrient inputs will completely become effective. (See also W76-11275) (Sims - ISWS)
W76-11286

PLUTONIUM DISTRIBUTION IN LAKE MICHIGAN BIOTA,
Argonne National Lab., Ill. Radiological and Environmental Research Div.
For primary bibliographic entry see Field 2H.
W76-11287

ASSESSMENT OF THE EFFECTS OF WASTE HEAT INPUTS ON WATER BUDGETS OF THE GREAT LAKES,
Acres Consulting Services, Ltd., Niagara Falls (Ontario).
R. A. Fleming, F. C. Elder, and P. J. Denison.
In: Proceedings, Seventeenth Conference on Great Lakes Research, Part 1; McMaster University, Hamilton (Ontario), August 12-14, 1974. International Association for Great Lakes Research, p 389-398, 1974. 3 fig, 4 tab, 14 ref.

Descriptors: *Heated water, *Thermal pollution, *Water loss, *Great Lakes, Powerplants, Nuclear powerplants, Thermal powerplants, Heat, Heat transfer, Evaporation, Water temperature, Cooling towers, Cooling water, Air temperature, Lakes, Limnology, Meteorology.
Identifiers: *International Field Year for the Great Lakes, Evaporative losses, Waste heat.

Monthly heat transfer coefficients were calculated for each of the Great Lakes including Georgian Bay, by means of a steady state model. Overlake meteorological data gathered during the International Field Year for the Great Lakes (IFYGL) provided information on lake modification of atmospheric parameters. Using updated predictions of the waste heat inputs to the Great Lakes in the year 2000 A.D., evaporative losses due to once through cooling were estimated at 1% of the mean flow down the St. Lawrence River. The use of wet cooling towers is expected to increase the losses by 20 to 40%. An estimated 17% of the evaporative losses from either system is expected to be recovered within the basin as precipitation. (See also W76-11275) (Sims - ISWS)
W76-11305

COMPOSITION OF THE OLIGOCHAET FAUNA OF CENTRAL LAKE MICHIGAN,
California Univ., Santa Barbara. Dept. of Biological Sciences.
R. P. Howmiller.
In: Proceedings, Seventeenth Conference on Great Lakes Research, Part 1; McMaster University, Hamilton (Ontario), August 12-14, 1974. International Association for Great Lakes Research, p 589-592, 1974. 1 fig, 1 tab, 9 ref.

Descriptors: *Oligochaetes, *Surveys, *Benthic fauna, *Lake Michigan, Worms, Tubificids, Aquatic life, Aquatic animals, Benthos, Sediments, Invertebrates, Annelids, Sludge worms, Water pollution, Pollutants, Sampling, Lakes, Limnology.
Identifiers: Lumbriculids, Enchytraeids.

An account was given of the composition of the oligochaete fauna of the central region of Lake Michigan based on examination of samples from 15 stations. The fauna consisted of Stylodrilus heringianus, Tubifex tubifex, Limnodrilus hoffmeisteri, Lumbricillus, and another enchytraeid which appears to belong to the Henle Enchytraeus group. Stylodrilus heringianus is, by far, the most common and abundant species, occurring at almost 90% ofthe worms examined. One station several miles off Grand Haven, Michig, yielded a sample dominated by Limnodrilus hoffmeisteri. This may be a reflection of local organic enrichment by polluted tributary rivers. (See also W76-11275) (Sims - ISWS)
W76-11323

PHOSPHORUS CYCLING AND LUXU PHOSPHORUS STORAGE BY ALGAE IN T WATERS OF GREEN BAY,
Wisconsin Univ., Green Bay. Coll. of Environmental Sciences.
J. C. Norman, and P. E. Sager.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-256 \$4.00 in paper copy, \$3.00 in microfiche. Wisconsin Water Resources Center, Madison, Techn Report WIS WRC, 76-04, July 1976. 39 p, 8 fi tab, 32 ref, 3 append. OWRT A-059-WIS(1) 14 0001-4050 14-31-0001-5050.

Descriptors: *Phosphorus compounds, Stor *Algae, *Cycling nutrients, *Water pollution fects, Adsorption, Wisconsin, Lake Michi Phosphates, Biomass, Metabolism, Phytoplankton, Eutrophication, Model stu Bays.
Identifiers: *Green Bay(Wis), Lean's model.

teep gradients in phosphate and phytoplankton iomass concentrations along a transect extending 5 km into Green Bay from the mouth of the Fox iver contrast greatly with apparently uniform hosphorus cycling rates between algae and water the same area. The luxury stoage of phosphorus y algae, expressed on a per unit biomass base, is early the same at all stations along the transect nd in excess of value thought to indicate hosphorus-limited conditions. It is suggested that milarities in turnover rates of phosphorus per nit biomass algae are due to the availability of hosphate in the water at levels well in excess of miting concentrations leading to a saturation ef- ct in phosphorus metabolism by the phytoplank- n. A modification of Lean's four compartment odel of the transfer of phosphorus between solu- e and particulate forms in the epilimnion of lakes necessary to make the model consistent with rtain observed transfer curves. By splitting the rticulate compartment into two distinct frac- ons and incorporating appropriate transfer coef- cients, differential rates of exchange with the rticulate compartment can be simulated. At least o different rates of exchange with the particu- e compartment appear to be necessary to make e model consistent with experimentally ob- rved, diphasic phosphorus transfer curves.
76-11332

XICITY: RESEARCH AND REGULATION,
C. Research Ltd, Vancouver.
C. Walden, and T. E. Howard.
: TAPPI Environmental Conference, Atlanta, orgia, April 26-28, 1976, Preprinted Proceedings APPI, Atlanta, Georgia), p 93-99. 58 ref, 2 tab.

scriptors: *Pulp wastes, *Toxicity, *Research d development, *Regulation, *Canada, Wastes, dustrial wastes, Water pollution sources, reign countries, Salmon, Fish, Phytoplankton, gae, Invertebrates, Lignins, Aquatic life, Lethal it, Foam fractionation, Effluents, Water pollu- n treatment, Water pollution effects, Legisla- n.
ntifiers: *Fraser River(British Columbia), sin acids, Fatty acids, Juvabione, Hormones.

xicity of pulp and paper mill effluents has been major environmental significance in Canada ce 3 bleached kraft mills were built in the 1960's he Fraser River watershed of British Columbia, of the world's major salmon-producing ers. Since then, regulatory control of the tox- y of Canadian pulp and paper mill discharges been established at the federal and, in some in- nces, at the provincial level. Acute toxicity of st pulp effluents to fish (salmon) has been ex- sively documented. Current studies are ex- ning the toxicity to invertebrates and toplankton (algae). Nonvolatile toxic con- ents of many pulp effluents have been ntified, in most cases accounting for all of the city. Toxicants include resin acids and unsatu- d fatty acids and various derivatives thereof, abione ('paper factor'), and related com- nds, and chlorinated lignin derivatives. Sub- tial sublethal studies have been directed to as- ing the effluent concentration below which no ss is exerted on aquatic organisms. Considera- evidence exists which indicates that this con- ration is about 0.05-0.10 of the 96-hr LC(50) e. The efficiency of biotreatment studies in xifying effluents has been examined. Foam tionation for detoxification is also being con- red. (Sykes-IPC)
-11374

TE TOXICITIES OF SPRUCE AND HEM- K BARK EXTRACTS TO SOME UARINE ORGANISMS IN SOUTHEASTERN SKA,
ka Dept. of Fish and Game, Petersburg.
. Buchanan, P. S. Tate, and J. R. Moring.
nal of the Fisheries Research Board of da, Vol. 33, No. 5, p 1188-1192, May, 1976. 1 2 ref, 2 tab.

Descriptors: *Bark, *Toxicity, *Estuaries, Aquatic life, *Water pollution effects, Shrimp, Crabs, Salmon, Pink salmon, Fish, Hemlock trees, *Alaska, Lumbering, Water pollution sources, Pollutans, Aquatic animals, Pink shrimp, Water pollution, Lethal limit, Water quality, Wood wastes, Softwood, Coniferous trees.
Identifiers: Sitka spruce(Picea sitchensis), Western hemlock(Tsuga heterophylla), Dungeness crab(Cancer magister).

Sitka spruce (Picea sitchensis) bark extracts were found to be toxic to adult and larval pink shrimp (Pandalus borealis) and larval Dungeness crab (Cancer magister). Sitka spruce and western hemlock (Tsuga heterophylla) bark extracts were found to be toxic to pink salmon (Oncorhynchus gorbuscha) fry. For salmon fry, toxic effects were observed as soon as 3 hr after exposure to hemlock bark extracts. After a 96-hr exposure, 50% of the test fry were killed at a concentration of 56 mg/liter, 96-hr LC(50). With a 96-hr exposure of spruce extracts, 50% of the fry were killed at concentrations of 100-120 mg/liter. Spruce bark extracts were consistently toxic to all invertebrates tested. The 96-hr LC(50) with larval shrimp, adult shrimp, and larval crabs were 415, 205, and 530 mg/liter, respectively. Using loss of swimming as the criterion, the 96-hr EC(50) for larval shrimp and larval crabs were 155 and 255 mg/liter respectively; EC(50) = medium effective concentration. Spruce bark pulp was 2-6 times more toxic than were extracts to shrimp larvae. (Witt-IPC)
W76-11393

ON-SITE BIOASSAY TESTING AT CARIBOO PULP AND PAPER,
Cariboo Pulp and Paper Co., Quesnel (British Columbia).
R. J. Salmons, and V. E. Johnson.
Pulp and Paper Canada, Vol. 77, No. 5, p 85-86 (T90-91), May, 1976. 1 fig, 2 ref.

Descriptors: *Bioassay, *Toxicity, *Rainbow trout, *Testing procedures, *Pulp wastes, Testing, Equipment, Fish, Effluents, Wastes, Industrial wastes, Water pollution sources, Water pollution effects, *Canada, Foreign countries, Labor, Scientific personnel, Pulp and paper industry, Water pollution control, Water quality control, Monitoring, Pollutant identification.

On-site bioassays with rainbow trout carried out by technical personnel at Cariboo Pulp and Paper Co. (British Columbia) have produced reliable and reproducible results without the use of expensive equipment. Only a few man-hrs/week are necessary to maintain equipment (e.g., glass-fiber holding tanks) and keep a healthy fish stock. The program has proven invaluable both as an effluent toxicity monitor and as a means of determining problem areas in the mill process. (Sykes-IPC)
W76-11394

MERCURY LEVEL AS A FUNCTION OF SIZE AND AGE IN NORTHERN PIKE, ONE AND FIVE YEARS AFTER THE MERCURY BAN IN SWEDEN,
Naturhistoriska Riksmuseet, Stockholm (Sweden).
M. Olsson.
Ambio, Vol. 5, No. 2, p. 73-76, 1976. 2 fig., 4 tab., 25 ref.

Descriptors: *Mercury, *Size, *Pikes, Water pollution effects, *Length, *Pulp wastes, Water quality control, *Absorption, Freshwater fish, Path of pollutants, Public health, Metabolism, Analytical techniques, Fish physiology, *Aging(Biological).
Identifiers: Tissue analysis, *Esox sp., *Sweden.

Mercury levels in a pike population in a lake previously polluted by a papermill decreased after the mercury discharge from the mill ceased. Of five tested parameters of size, length correlated best with mercury levels. For this correlation a significant difference was found between the sexes: males (which grow more slowly) had higher levels than females. Male pike of different ages but the same length showed similar mercury levels. Results indicated that mercury levels in pike increase during starvation. (Katz)
W76-11401

A COMPARATIVE STUDY OF THE EFFECTS ON THE MARINE ENVIRONMENT OF WASTES FROM CELLULOSE INDUSTRIES IN SCOTLAND AND SWEDEN,
Dunstaffnage Marine Research Lab., Oban (Scotland).
T. H. Pearson, and R. Rosenberg.
Ambio, Vol. 5, No. 2, p. 77-79, 1976. 5 fig., 16 ref.

Descriptors: *Bioindicators, *Pulp wastes, Water pollution effects, *Sediments, *Fjords, Ecosystems, Biological communities, *Succession, Populations, *Benthic fauna, *Productivity, Water pollution sources, Benthos, Mollusks, Organic wastes, Analytical techniques, Invertebrates, Biomass.
Identifiers: *Species diversity, *Scotland, *Sweden.

Environmental conditions in two fjordic systems, one in Scotland and one in Sweden, are described and compared. Successional changes in the benthic fauna of the two systems are compared, primarily in relation to the input of organic material from the effluents of pulp and paper mill. Quantitative data are presented on the number of species present, together with abundance and diversity, changes in all of which show similarities in both areas. The relationship between faunal structure and sediment structure is considered; the use of benthic fauna to assess and predict the effect of organic pollution is discussed, and different methods of data presentation are assessed. (Katz)
W76-11402

OLIGOTROPHICATION - A SELF-ACCELERATING PROCESS IN LAKES SUBJECTED TO EXCESSIVE SUPPLY OF ACID SUBSTANCES,
Institute for Water and Air Pollution Research, Stockholm (Sweden).
O. Grahn, H. Hultberg, and L. Landner.
Ambio, Vol. 3, No. 2, p. 93-94, 1974. 2 fig., 14 ref.

Descriptors: *Hydrogen ion concentration, *Acidic water, Aquatic populations, Ecosystems, Environmental effects, *Lakes, *Biomass, *Calcium, Chemical properties, Populations, *Oligotrophy, *Lake stages, *Biota, Mollusks, Mayflies, Balance of Nature, Trophic level, Benthos, Productivity, Mosses, Sampling, Eutrophication, Water pollution effects.
Identifiers: *Oligotrophication, *Sweden.

From integrated biological studies of six acidified lakes (pH values between 4.4 and 5.4) in western Sweden, it has been concluded that primary changes in the composition of plant and animal populations, caused by the supply of acid substances, induce other long-term changes that will perturb the entire lake ecosystem and accelerate further acidification. (Katz)
W76-11403

THE EFFECTS OF AQUEOUS EXTRACTS OF CRUDE OIL AND NAPHTHALENE ON THE PHYSIOLOGY AND MORPHOLOGY OF A FRESHWATER GREEN ALGA,
C. Soto, J. A. Hellebust, and T. C. Hutchinson.
Verhandlungen Internationale, Vereinigung Limnologie. Vol. 19, p. 2145-2154, November, 1975. 6 fig., 10 ref.

Descriptors: *Oil wastes, Water pollution effects, *Algae, *Toxicity, *Growth rates, *Absorption, *Plant morphology, *Primary productivity, Or-

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ganic compounds, *Photosynthesis, Analytical techniques, Tracers, Laboratory tests, Carbon radioisotopes, Methodology, Electron microscopy, *Chlorophyta.
Identifiers: Sub-lethal effects, *Aqueous oil extracts, *Naphthalene, *Chlamydomonas sp.

Investigations were conducted to determine the effects of aqueous extracts of crude oil and naphthalene on Chlamydomonas angulosa in regard to several physiological and morphological parameters. Growth inhibition was dependent on the conditions of treatment and growth stimulation was observed in a 'closed' system containing aqueous crude oil extract. Photosynthetic capacity was immediately and almost completely inhibited following naphthalene treatment. Aqueous crude oil extracts produced a less severe effect. Cellular protein decreased to 66% of the original amount over a 7-day exposure to naphthalene. Recovery was rapid when returned to fresh medium. Napthalene-treated C. angulosa cells became nonmotile due to loss of flagella, developed granulation in the cytoplasm and membrane-like material enveloped the cell. Other morphological changes were observed with both the light and electron microscopes. Similar, but less severe, changes were observed with aqueous crude oil extracts. (Katz)
W76-11404

FIELD STUDIES ON THE PHYTOTOXICITY OF CRUDE OIL TO SUBARCTIC AQUATIC VEGETATION,
B. M. Hanna, J. A. Hellebust, and T. C. Hutchinson.
Verhandlungen Internationale, Vereinigung Limnologie, Vol. 19, p. 2165-2171, November, 1975. 4 fig., 2 tab., 4 ref.

Descriptors: Oil, *Oil spills, Water pollution effects, *Primary productivity, Productivity, *Algae, *Chlorophyll, *Baseline studies, Mosses, *Subarctic, *Toxicants, On-site investigations, Biomass, Plant growth, Plant populations, Oil pollution, Lake shores, Cold regions, Toxicity, Permafrost, Methodology, *Phytotoxicity.
Identifiers: *Horsetails, *Sedges, Equisetum sp., Carex sp.

To determine the effect of an oil pipeline spill on lakes and ponds in the arctic, oiled and control test cylinders were established in a small lake. Algal species showed reduced productivity after introduction of crude oil into the system. Moss also showed a reduction in productivity that was not statistically significant in terms of control productivity. Chlorophyll a and b concentrations for sedge and horsetails showed significant reductions from surface contamination with oil. Baseline data on several growth parameters of a vegetative subarctic aquatic community were established. (Katz)
W76-11405

PROCEEDINGS, SEVENTEENTH CONFERENCE ON GREAT LAKES RESEARCH, PART 2.
For primary bibliographic entry see Field 2H.
W76-11424

THE ABUNDANCE OF DIATOMS IN THE SOUTHWESTERN NEARSHORE REGION OF LAKE ONTARIO DURING THE SPRING THERMAL BAR PERIOD,
State Univ. of New York Coll. at Buffalo. Great Lakes Lab.
For primary bibliographic entry see Field 2H.
W76-11425

PHYTOPLANKTON BIOMASS, SPECIES COMPOSITION AND PRIMARY PRODUCTION AT A NEARSHORE AND A MIDLAKE STATION OF LAKE ONTARIO DURING IFYGL,
Canada Centre for Inland Waters, Burlington (Ontario).
M. Munawar, P. Stadelmann, and I. F. Munawar.
In: Proceedings, Seventeenth Conference on Great Lakes Research, Part 2; McMaster University, Hamilton (Ontario), August 12-14, 1974. International Association for Great Lakes Research, p 629-652, 1974. 8 fig, 8 tab, 55 ref.

Descriptors: *Phytoplankton, *Biomass, *Primary productivity, *Lake Ontario, Plankton, Nannoplankton, Surveys, Sampling, Chlorophyll, Algae, Diatoms, Dinoflagellates, Productivity, Nutrients, Water temperature, Size, Lakes, Limnology, Biology.
Identifiers: *International Field Year for the Great Lakes, Nearshore, Midlake, Species composite, Netphytoplankton.

As part of the Canadian contribution to the International Field Year for the Great Lakes (IFYGL), qualitative and quantitative analyses of phytoplankton were carried out at a nearshore and a mid-lake station. Samples were collected on two consecutive days by an integrating sampler (0-10 m) during nine cruises extending from April 1972 to March 1973. Simultaneously, chlorophyll a samples were taken, and carbon-14 uptake was measured in an incubator. About one hundred taxa were identified in samples from each station and contained several phytoflagellates and 'less common' species neglected in other IFYGL investigations. On a biomass basis the 'less common' species contributed significantly to the total phytoplankton biomass. The dominance of phytoflagellates for most of the year at both stations was striking. Similarly, nannoplankton (less than 64 micron) dominated the phytoplankton at both stations throughout the study period. At times more than 85% of the total photosynthesis was due to the nannoplankton fraction. At the nearshore station, phytoplankton biomass and chlorophyll a ranged from 0.2 to 2.3 g/cu m and 1.9 to 8.0 mg/cu m respectively. At the midlake station, the phytoplankton biomass and chlorophyll a ranged from 0.2 to 1.6 g/cu m and from 1.0 to 7.7 mg/cu m respectively. On a volumetric basis, the production/biomass quotient (activity coefficient) ranged between 0.002 to 0.026/hr and 0.002 to 0.02/hr at the nearshore and midlake stations respectively. (See also W76-11424) (Sims - ISWS)
W76-11426

A PRELIMINARY STUDY ON THE OCCURRENCE AND DISTRIBUTION OF GEOFUNGI IN LAKE ONTARIO NEAR THE NIAGARA RIVER,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 2H.
W76-11427

BACTERIAL POPULATIONS IN LOWER GREEN BAY,
Wisconsin Univ. Green Bay, Coll. of Environmental Sciences.
For primary bibliographic entry see Field 2H.
W76-11428

PHOSPHATE, ALGAE, AND TACONITE TAILINGS IN THE WESTERN ARM OF LAKE SUPERIOR,
Texas Univ. at Dallas. Richardson. Inst. for Environmental Sciences.
R. H. Plumb, Jr., and G. F. Lee.
In: Proceedings, Seventeenth Conference on Great Lakes Research, Part 2; McMaster University, Hamilton (Ontario), August 12-14, 1974. International Association for Great Lakes Research, p 823-836, 1974. 7 fig, 3 tab, 26 ref.

Descriptors: *Phosphates, *Algae, *Mine wastes, *Lake Superior, Eutrophication, Phosphorus compounds, Water pollution sources, Water quality, Phosphorus, Environmental effect, Waste disposal, Lakes, Surveys, Sampling, Leaching, Laboratory tests, Nutrients, Bioassay, Sorption, Primary productivity, Limnology.
Identifiers: *Taconite tailings

The purpose of this investigation was to evaluat the significance and availability of phosphate a sociated with taconite tailings that are presentl being discharged into the Minnesota waters o Lake Superior. Laboratory leaching studie showed that phosphate would not be leached fro tailings in measurable quantities during a thre year period and that phosphate from this source insignificant compared to other sources in th study area. In addition, laboratory bioassays wi Selenastrum and Lake Superior algae as well as in situ bioassays demonstrated tailings to be no stimulatory and non-toxic. Since an observation the primary productivity distribution in th western area, Lake Superior showed no appare effect in the discharge area and agreed with th measured and calculated phosphate flux distrib tion, it was concluded that the discharge taconite tailings would not contribute to th eutrophication of the lake. (See also W76-1142 (Sims - ISWS)
W76-11441

POPULATION DYNAMICS AND PRODUCTIO OF DAPHNIA HYALINA IN A EUTROPH RESERVOIR,
Freshwater Biological Association, Wareha (England). Windermere Lab.
D. G. George, and R. W. Edwards.
Freshwater Biol. 4(5); p 445-466, 1974.

Descriptors: Algae, Cyanophyta, Daphn *Eutrophication, *Primary productivity, Res voirs, Food chains, Water pollution effects.
Identifiers: *Daphnia-Hyalina, Eglwys Nynydd Wals).

The population dynamics and production of hyalina, the dominant cladoceran in Eglw Nynydd, a shallow eutrophic reservoir in So Wales, were studied for 2 yr against a backgrou of limnological measurements. The appearan and development of successive generations fr egg to adult could be followed from changing nu bers in arbitrarily defined size classes. Seaso variations in mean length, mean brood-size proportion of gravid adults were recorded mean brood-size was related to changing food temperature conditions. Egg-development ti for D. hyalina were determined in culture and population parameters finite birth (B), instanta ous birth (b'), instantaneous population cha (r'), instantaneous death (d') and finite death r (D) were estimated from field data. Turnover production estimates were calculated from fi death rates and biomass. The calculated pote rate of increase (b') was nearly always greater t the observed rate of increase (r'): seas changes in death rate (d') generally par changes in birth rate (b') but remain somewhat of phase. Population oscillations are probably to a delay in the expression of the effects of po lation density upon birth and death rates. production of Daphnia accounts for less than of gross primary production. However, the pat of population growth of Daphnia in Egl Nynydd almost certainly reflects a food lim system. In summer, blue-green algae may be a dant but serve as a poor food source.--Copy 1975, Biological Abstracts, Inc.
W76-11457

OBSERVATIONS ON THE EFFECTS CRUDE OIL POLLUTION ON THE SAN BEACH SNAIL, BUL (GASTROPODA:PROSOBRANCHIATA),
Cape Town Univ. (South Africa). Dept. of Zo gy.
A. C. Brown, P. De B. Baissac, Leon, and Bel Trans R Soc S Afr. 41(1); p 19-24, 1974.

Descriptors: *Oil pollution, *Snails, Water p tion effects, Weathering.
Identifiers: Bullia, Crude oil, Gastrop Prodobranchiata, Snail.

effect of crude oil on Bullia was observed in field, following an oil spill, and in the laboratory using a light Arabian oil. Well-defined stress ptoms appear at sub-lethal concentrations; at er doses these give way to paralysis before h ensues. Very low concentrations are fatal if e is contact between the animals and the oil, if the oil has been weathered. If there is no ct contact much higher concentrations of fresh an be tolerated and weathering greatly reduces effects. Mass mortality is unlikely to occur ugh eating oil-contaminated food.--Copyright , Biological Abstracts, Inc.
-11459

ALERT BAY OIL SPILL: A ONE-YEAR DY OF THE RECOVERY OF A CON-INATED BAY,
ronment Canada, Victoria, B. C. (Canada). ne Sciences Directorate, Pacific Region.
Green, C. Bawden, W. J. Cretney, and C. S. g.
ic Marine Science Report No. 74-9, June 43 p, 3 ref.

riptors: *Continental shelf, *Canada, *Oil , *Oil pollution, *Environmental effects, gy, *Fossil fuels, Chemistry, Bacteria, hering, Pollution, Bays.
ifiers: Outer Continental Shelf, *British nbia, Cormorant Island(BC), Biological ef-

nuary 24, 1973, the freighter Irish Stardust ded on Haddington Reef rupturing two fuel , and spilling roughly 200 tons of heavy '1000 d' fuel oil into Broughton Strait. The majori- this oil was deposited along the shores to the y the receding high tide on the morning of ry 25. The town of Alert Bay on Cormorant was the community most affected. Major up operations were conducted on the es of Cormorant Island and other islands r to the east. However, one of the more con- ated bays was sufficiently isolated that it be left undisturbed for scientific study. This as code-named Reserved Bay. Only those s that were in direct contact with oil seem to een harmfully affected, particularly limpets riwinkles. No species has been completely ated, and there are indications that nization is occurring. It appears that there be any permanent effects on the biological unity at Reserved Bay. The pattern of con- tion remained identical throughout the year- study, with the exception of the oiled ed and sand, which were gradually ed. The major mechanism for altering the try of the oil in the bay was the action of a. The beach at Reserved Bay was still pol- y oil one year after the spillage occurred. er, approximately 90-95% of the volume of had been removed by various natural es, and the area was beginning to recover he relatively small amount of biological that had occurred. (Sinha - OEIS)
463

ONMENTAL IMPACTS OF OCS OIL AS ACTIVITY,
ity of South Florida, Tampa. Dept. of phy.
nary bibliographic entry see Field 6G.
471

EAST COAST RESEARCH ACTIVI- F ERDA,
of Biomedical and Environmental h (USERDA), Washington, D. C.
nary bibliographic entry see Field 6G.
477

GICAL CONSIDERATIONS,
niv., Beaufort, N. C. Marine Lab.
nary bibliographic entry see Field 6G.

W76-11484

AN INTEGRATED STUDY ON THE IMPACT OF METALLIC TRACE ELEMENT POLLUTION IN THE COEUR D'ALENE-SPOKANE RIVERS-LAKE DRAINAGE SYSTEM,
Washington State Univ., Pullman. Dept. of Sanitary Engineering.
W. H. Funk, F. W. Rabe, R. Fibly, G. Bailey, and P. Bennett.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-256 724, $40.00 in paper copy, $3.00 in microfiche. Joint Project Completion Report Between Washington State University and the University of Idaho, August 1975. 332 p, 89 fig, 81 tab, 166 ref, 4 append. OWRT C-4145(9060)(4).

Descriptors: *Metals, *Trace elements, *Heavy metals, *Washington, Lakes, Rivers, *Food chains, *Productivity, Water quality, Absorption, Zinc, Drainage systems, Copper, Neutron activation analysis, Pollutant identification, Water pollution effects, Iron.
Identifiers: *Trace metals, Coeur d'Alene Lake(Wash), Spokane River(Wash).

Comprehensive limnological, water quality, productivity and substrata investigations have been made of the Coeur d'Alene drainage, Coeur d'Alene Lake and the Spokane River. These investigations were made in an attempt to answer questions as to the passage of metallic elements through the aquatic food chain in the study area as well as to determine the critical factors involved in the poor recovery of the South Fork and main stem of the Coeur d'Alene River. Additional work was carried out to determine the water quality of these areas and the Spokane River. Extensive studies were also made upon the substrata and limiting factors for macroinvertebrates of the Upper Spokane River. Heavy metals, such as Zn, Cu, and Pb, appear to be concentrated to relatively high amounts in algae, aquatic macrophytes and other vegetation growing along the river. Algae and detritus-consuming macroinvertebrates pass these metals along to the fishes. However, there appears to be a reduction of concentration of metals in tissues at each trophic level as one moves up the food chain. The organisms appear to be actively excreting the metals. In the fishes, the filter bodies such as the kidneys and liver confirm this assumption. Nonetheless, the level of Zn, for example, in the muscle tissues of Spokane River fishes may be two to three times that in muscle tissues of the same species taken from undisturbed streams high in Coeur d'Alene drainage. For these reasons it has been concluded that additional efforts should be made to curtail and control seepage from tailings ponds as well as reduction and eventual control of wastes and nutrient runoff in the Coeur d'Alene and Spokane river drainage basins.
W76-11488

AN ENVIRONMENTAL ASSESSMENT OF IMPACTS OF COAL DEVELOPMENT ON THE WATER RESOURCES OF THE YAMPA RIVER BASIN, COLORADO AND WYOMING--PHASE-II WORK PLAN,
Geological Survey, Denver, Colo.
T. D. Steele, I. C. James, II, and D. P. Bauer.
Open-file report 76-368, May 1976. 33 p, 2 fig, 2 tab, 60 ref.

Descriptors: *Environmental effects, *Coal mine wastes, *Water pollution sources, *Energy conversion, *Project planning, Evaluation, Projections, Water resources development, Water rights, Water quality control, Water demand, River basin development, Public lands, Land use, Rehabilitation.
Identifiers: *Yampa River Basin(Colo-Wyo), Residuals management.

The Yampa River Basin Assessment in Colorado and Wyoming is a 2.5-year program of the U.S. Geological Survey. It is designed primarily to assess the availability and quality of the basin's water resources. The basin assessment also will evaluate potential environmental and selected socioeconomic impacts of energy-resource development plans proposed by mining and power companies. This report serves as a project work plan for the basin assessment. It describes the program objectives, and the various approaches of analysis and evaluation. Environmental studies are outlined for analyzing both the direct effects of various proposals regarding coal mining, transportation, and conversion, and the secondary effects resulting from increased population and urban growth. The basin assessment is designed to provide Federal, State and local decision-makers with the basic environmental information needed to formulate and to evaluate policies for the development of energy resources. The techniques applied and conclusions reached in the Yampa River Basin Assessment should aid similar studies in other energy-rich basins in the Western United States. (Woodard-USGS)
W76-11500

RECENT CHANGES IN ATLANTIC SALMON (SALMO SALAR) RUNS IN THE LIGHT OF ENVIRONMENTAL CHANGES IN THE SAINT JOHN RIVER, NEW BRUNSWICK, CANADA,
Environmental Protection Service, St. John's (Newfoundland).
C. L. Dominy.
Biol Conserv. 5(2), p 105-113, 1973.

Descriptors: *Atlantic salmon, *Canada, Rivers, Environmental effects, Waste disposal, *Organic wastes, *Toxicity, Waste assimilative capacity, Water quality, Pollution abatement, Industrial wastes.
Identifiers: *Saint John River(N.B.).

Deterioration of water quality as a result of the disposal of untreated organic and toxic wastes into the Saint John River Basin began when the river was 1st settled in 1604, and the amount of waste entering the river has increased substantially over the past 2 decades. Hydroelectric power developments constructed on the main stem of the river during this recent period have added to the problem by reducing the biological assimilative capacity of the river. The significance of these cultural influences for atlantic salmon (S. salar) in the river has been to reduce the quality of its migration route to and from the sea, to eliminate some of its freshwater spawning and rearing areas, and to cause direct mortality of adult and juvenile salmon. As a consequence, the total salmon stock in the Saint John River has declined by approximately 40% over the past 2 decades. The future prospects for conserving this valuable natural resource in the Sant John River are moderately bright in view of current activities in water pollution abatement, effective regulation of the salmon fisheries, and large-scale artificial propagation.--Copyright 1973, Biological Abstracts, Inc.
W76-11508

EFFECT OF PYRIDINE DISSOLVED IN WATER ON THE GASTRIC AND INTESTINAL MUCOSA OF EXPERIMENTAL ANIMALS, (IN RUSSIAN),
Ternopol State Medical Inst. (USSR).
V. A. Kondratyuk.
Gig Sanit. 11, p 87-88, 1974.

Descriptors: Potable water, *Toxicity, Calcium, Magnesium, Ions, Organic compounds, *Pyridine pesticides, Rodents.
Identifiers: *Intestinal mocosa.

Experiments on male white rats established that Ca ions contained in drinking water intensify the toxic effect of pyridine to a greater degree than Mg ions. On the basis of this data, the presently existing maximum allowable concentration pyridine in water bodies is too high if the ion composition of

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drinking water is taken into account.--Copyright 1975, Biological Abstracts, Inc.
W76-11526

HYGIENIC EVALUATION OF AN EPOXY COMPOUND AND THE POSSIBILITY OF ITS USE IN SUBMERSIBLE ELECTRIC PUMPS FOR DOMESTIC PURPOSES, (IN RUSSIAN),
Kiev Research Inst. of General Communal Hygiene (USSR).
V. V. Tsapko, V. N. Kupyrov, V. I. Vorobets, L. P. Vlasova, and G. A. Dolgikh.
Gig Sanit. 10, p 106-107, 1974.

Descriptors: *Organoleptic properties, Oxidation, *Organic compounds, *Animal pathology, Pumps, Rodents, Public health, Toxicity.
Identifiers: *Epoxy compounds, Polyethylene polyamine.

Epoxy compound OKE.504.004, intended for waterproofing the windings of motors of domestic submersible electric pumps, on contacting water for 1 mo. does not affect the organoleptic properties of water. A study of its chemical composition showed an increase of oxidizability and traces of polyethylene-polyamine. Pathological investigations on rats (6-mo. experiment) showed that water in long contact with the epoxy compound causes hemodynamic disorders in the liver, kidneys and adrenal glands, functional changes of the CNS and an increase of the content of ascorbic acid in the adrenal glands and of RNA in the liver. The epoxy compound should not be used for domestic drinking water supply systems, but can be used for waterproofing motors in pumps for watering gardens, washing cars, laundering and other domestic purposes.--Copyright 1975, Biological Abstracts, Inc.
W76-11528

HYGENIC EVALUATION OF IONIC COMPOSITION OF AN IMITATION OF DESALINATED SEA WATER, (IN RUSSIAN)
Nauchno-Issledovatelskii Institut Gigieny, Moscow (USSR).
T. K. Parkhomchuk, Yu. V. Novikov, A. F. Aksyuk, Z. A. Anisimova, and A. N. Sergeev.
Gig Sanit. 4, p 22-26, 1974. (In Russ. with Engl. summ.).

Descriptors: *Sea water, *Desalination, *Ions, Public health, Potable water, Rodents, Metabolism, Water treatment, Water quality standards.

Imitation desalinated sea water, with salt content within the levels stipulated by the drinking water standard, caused no disturbances of the examined physiological processes in rats. Prolonged use of imitation desalinated sea water with excessive or low salt content produced in rats functional shifts in the fluid-electrolyte metabolism processes and a strain on adaptation mechanisms and morphological changes in the CNS.--Copyright 1975, Biological Abstracts, Inc.
W76-11529

HYGIENIC EVALUATION OF POLYCHLOROPINENE AND ALKYLBENZENE SULFONATE PRESENT TOGETHER IN SURFACE WATERS, (IN RUSSIAN),
Nauchno-Issledovatelskii Institut Epidemiologii, Mikrobiologii i Gigieny, Vilnius (USSR).
D. G. Krasil'shchikov.
Gig Sanit. 10, p 99-100, 1974.

Descriptors: Public health, *Alkylbenzene sulfonates, Organic compounds, *Pesticide residues, *Chlorinated hydrocarbon pesticides, Rodents, Toxicity, Water pollution effects, Detergents, Lethal limit.
Identifiers: *Polychloropinene.

Under model conditions alkylbenzene sulfonate (ABS) and its binary mixtures with the pesticide polychloropinene in concentrations exceeding the maximum allowable concentration (MAC) by 5 fold and more caused inhibition of the level of O2 consumption, the extent of which depended on the concentration of the substances added to river water. Their combined pollution of surface waters can lead to deterioration of the natural self-purification of water from organic pollutants. The long-time intake of polychloropinene, with water at dose levels exceeding the MAC by 10 fold led to the development of functional shifts in rats, and the simultaneous presence of ABS in the water intensified the effect of the pesticide. In concentrations amounting to 1/2 and 1 MAC both substances and their mixtures were inactive with respect to the indices during 7-mo. peroral poisoning of rats. -Copyright 1975, Biological Abstracts, Inc.
W76-11530

THE PROBLEM OF MERCURY IN THE MEDITERRANEAN, (IN FRENCH),
Centre d'Etudes et de Recherches de Biologie et d'Oceanographie Medicale, Nice (France).
For primary bibliographic entry see Field 5B.
W76-11531

BACTERIOCOENOTIC STUDIES ON A WEAKLY DYSTROPHIC STREAM, (IN GERMAN),
K. W. Kuchar.
Sydowia Ann Mycol. 26(1-6), p 32-40, 1972.

Descriptors: Hydrogen ion concentration, Pseudomonar, *Bacteria, *Dystrophy, Oligotrophy, *Pollutant identification, Streams.
Identifiers: *Bacteriocenotic studies, *Dystrophic streams, Biotopes.

A small weakly dystrophic stream of an oligozoic type with a low biotope quotient is characterized by its low alkalinity and by its quantitatively and qualitatively poor biocoenos. This is reflected in the species-and colony-poor bacteriocoenose. Quantitative control methods in the field detected gram negative species; in particular, pseudomonads.--Copyright 1975, Biological Abstracts, Inc.
W76-11533

BACTERIOCOENOTIC STUDIES ON AN OLIGOTROPHIC STREAM, (IN GERMAN),
K. W. Kuchar.
Sydowia Ann Mycol. 26(1-6), p 184-189, 1972.

Descriptors: Bacteria, *Oliotrophy, *Pseudomonas, *Pollutant identification, Streams.
Identifiers: *Bacteriocenotic studies, Oligotrophic streams, Vibrio sp.

A small oligotrophic stream is characterized by a bacteriocoenose in which pseudomonads predominate (81%). Vibrio sp. comprised 15% of the total colony. Gram positive non-spore-producers were not present.--Copyright 1975, Biological Abstracts, Inc.
W76-11534

BACTERIOCOENOSE STUDIES ON AN EUTROPHIC BIOTOPE, (IN GERMAN),
K. W. Kuchar.
Sydowia Ann Mycol. 26(1-6), p 190-198, 1972.

Descriptors: *Bacteria, Eutrophication, *Pseudomonas, Seasonal, Pollutant identification.
Identifiers: *Bacillus, *Bacteriocenotic studies, *Callitriche, *Eutrophic biotopes.

A clearly eutrophic Callitriche-biotope is characterized in its summer aspect by a bacterial association made up of 4 components: up to 37% Pseudomonas, up to 35% gram negative non-pseudomonads, up to 21% gram positive non-spore-producers, and 1% Bacillus spp..--Copyright 1975, Biological Abstracts, Inc.
W76-11535

INVERTEBRATE FAUNA OF THE LAKES OF THE LOWER TAREYA RIVER (WESTERN TAIMYR), (IN RUSSIAN),
Moscow State Univ. (USSR). Dept. of Invertebrate Zoology.
N. M. Shabanova.
Vestn. Mosk. Univ. Ser. 6, Biol. Pochvoved. 29(6), p 3-7, 1974.

Descriptors: *Invertebrates, *Lakes, Rivers, *Reservoirs, Ponds, Zooplankton, Daphnia, *Rotifers, *Eutrophication, *Oligotrophy.
Identifiers: Acanthocyclops Capillatus, Asplanchna Sp, Daphnia Arctica, Daphnia Pulex, Diaptomus Bacillifer, Eucypris Glacialis, Eurycercus Glacialis, Heterocope Borealis, Lepidurus Arcticus, Polyartemia Forcipata, Polyarthra Sp, *USSR(Lower Tareya River), Western Taimyr.

Small lakes and pools around the Taimyr station (Russian SFSR, USSR) maintain a fairly diverse fauna of invertebrates. There are some oligotrophic and eutrophic reservoirs as well as intermediate ones. The few small dystrophic reservoirs are shallow with the brown water rich in humic acids. The zooplankton of oligotrophic lakes is characterized by the great variety of wheel animalcules (Rotifera) as compared with other types of reservoirs. Zooplankton analysis showed some common forms (Diaptomus bacillifer, Daphnia pulex, Asplanchna, Polyarthra), and a number of northern species (Heterocope borealis, Acanthocyclops capillatus, D arctica, Eurycercus glacialis, Eucypris glacialis, Lepidurus arcticus, Polyartemia forcipata).--Copyright 1975, Biological Abstracts, Inc.
W76-11537

BACTERIAL POPULATIONS IN SKADAR LAKE, (IN SERBO-CROATIAN),
Zavod Za Biologiju Mora, Kotor (Yugoslavia).
Bosiljka Ristanovic.
Glas Repub Zavoda Zast Prir Prir Muz Titograd, 7, p 37-48, 1974.

Descriptors: *Bacteria, Lakes, Europe, *Oligotrophy, *Anaerobic bacteria, Bioindicators, Cultures, *Aerobic bacteria, Pollutant identification.
Identifiers: Azotobacter-Agilis, Azotobacter, Chroococcum, Beggiatoa-Alba, Beggiatoa-Leptomitiformis, Cellvibrio-Fulvus, Chromatium Minus, Cytophaga-Lutea, Pseudomonas Fluorescens, Siderocapsa, Spirillum-Volutans, *Yugoslavia(Skadar Lake).

During 1972-1973 aerobic and facultative anaerobic bacterial populations in different parts of oligotrophic Skader Lake (Yugoslavia) were investigated. The plate culture method was used. The total number of bacteria was 16-1500/ml of water. The lowest count was in the Radus upwelling spring area in May 1973 and the highest in the zone of macrovegetation in Dec. 1972. Dominant species were: Pseudomonas fluorescens, Migula and Spirillum volutans Ehrenberg. Up to 34/ml nitrogen-fixing bacteria were found, predominantly Azotobacter agilis Beijerinck and A. chroococcum Beijerinck. The number of cellulose-decomposing bacteria was as high as 10/ml. Dominant species were Cytophaga lutea Winogradsky and Cellvibrio fulvus Stap et Bort, which had marginal activity. Sulphur bacteria were Beggiatoa alba (Vaucher) Trevisan, B. leptomitiformis Trevisan and Chromatium minus Winogradsky. The only Fe bacterium detected was Siderocapsa major Molisch. Only 3.2%-14.5% of the ammonificators tested survived in media with a phenol concentration of 10 mg/l, and only 0.07%-2.6% on a phenol concentration of 1 mg/l. Bacteriological processes were probably most intensive in Skadar Lake because of the best stand of aquatic plants and favorable temperature and O2 relations. The transformation of organic matter is slow and scanty.--Copyright 1975, Biological Abstracts, Inc.
W76-11538

IE IMPORTANCE OF INHIBITING SUB-
ANCES IN THE CONTROL OF ALGAL AND
CTERIAL POPULATIONS OF MARINE
ANKTON, (IN FRENCH),
ntre d'Oceanographie, Marseille (France). Sta-
n Marine d'Endoume.
r primary bibliographic entry see Field 5G.
76-11542

FECT OF SULFITE EFFLUENTS OF CELLU-
SE-PAPER MILL ON VITALITY OF
PHNIA MAGNA STRAUS, (IN RUSSIAN),
ademiya Nauk Litovskoi SSR, Vilnius. Institut
logii i Parazitologii.
P. Klimashauskene.
t Tsr Mokslu Akad Darb Ser C Biol Mokslai. 1,
1-120, 1974.

criptors: Daphnia, Effluents, *Pulp wastes,
lulose, Yeast, Water pollution effects,
dustrial wastes, Sulfite liquors.
ntifiers: *Daphnia-Magna.

effluent most harmful to D. magna was from a
st shop. In undiluted effluent daphnias sur-
d for 30-40 min. In 6.25-0.78% concentration
tions of the effluent, they survived for 1-5
s. In 0.39% dilutions they remained viable for
whole testing time and showed a considerable
ease in biomass, although a certain
urbance of development was noted. A 0.19%
centration is the maximum permissible concen-
on for normal development. Other types of ef-
nt were less harmful. The maximum permissi-
effluent concentrations for crustacean survival
3.125% for effluent from acid and barking
s and from cardboard, paper and pulp shops
a settler, and 6.25% for effluent from card-
d, paper and pulp shops after filters. The
% effluent from cardboard, paper and pulp
s after filters, the 3.125% effluent from acid
barking shops and the 1.56% effluent after a
er showed no unfavorable effect on
acean development.--Copyright 1975, Biolog-
Abstracts, Inc.
-11544

CT OF COPPER SULFATE ON MUCUS
LS IN YOUNG TROUT (SALMO IRIDEUS),
RENCH).
ouse-3 Univ. (France). Laboratoire
physiologie des Animaux.
quignot, R. Labat, and A. Chatelet.
Toxicol Environ Hyg. 8(1), p 52-56, 1975.

riptors: *Copper sulfate, Trout, Cytological
es, Environmental effects, Water pollution
ts, Metals, Copper.
ifiers: Salmo-Irideus.

s epithelia of young trouts poisoned by
4 were observed. A decrease in the number
ined mucus cells in the skin and intestine was
d. This response may indicate a slowing
of mucus secretion which couldbe typical of
onment pollutant) Cu poisoning.--Copyright
Biological Abstracts, Inc.
1545

EFFECT OF PREPARATION ON THE
CURY CONTENT OF FISH AND
ROOMS, (IN GERMAN),
sforschungsanstalt fuer Lebensmittel-
altung, Karlsruhe (West Germany). Institut
rahlen-technologie.
imary bibliographic entry see Field 5A.
1546

ARY-TOXICOLOGIC ASSESSMENT OF
COMPOUNDS, (IN RUSSIAN),
skaya Sanitarno-Epidemio logicheskaya
ya, Moscow (USSR).
ysogorova.
nit. 5, p 16-19, 1974.

Descriptors: *Iron compounds, *Toxicity, Potable water, Rodents, Water pollution effects.

Fe present in drinking water was highly toxic to rats in acute and chronic experiments. In a chronic test a pronounced toxic effect was obtained at Fe concentrations of 1000 and 100 mg/l and lesser effect was found at a concentration of 10 mg/l. An inefficient dose amounted to 1 mg/l.--Copyright 1975, Biological Abstracts, Inc.
W76-11547

THE HYPOTHALAMO-HYPOPHYSEAL NEUROSECRETORY SYSTEM OF THE GUPPY LEBISTES RETICULATUS UNDER CHRONIC PHENOL INTOXICATION, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Institut Biologii Vnutrennykh Vod.
V. E. Matei.
Zh Evol Biokhim Fiziol. 9(5), p 481-486, 1973.

Descriptors: *Phenols, *Toxicity, Water pollution effects, Fish.
Identifiers: Guppy, Intoxication, *Lebistes-Reticulatus, *Neurological fish studies(Hypothalamo-hypophyseal).

Phenol in minimal subtoxic concentrations enhances the activity of the hypothalamo-hypophyseal neurosecretory system (HHNS) of the fish. Higher concentrations of the agent induce active excretion of neurohormone from the HHNS up to its complete devastation. The neurohypophysis exhibits the highest reactivity under stress situations. Phenol intoxication results in phase changes in the HHNS, which are accompanied by disturbances in the higher nervous activity of fishes.--Copyright 1975, Biological Abstracts, Inc.
W76-11549

DDT AND ITS METABOLITES IN SOME CESTODES IN FISHES, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.
I. I. Perevozchenko, and O. N. Davydov.
Gidrobiol Zh. 10(6), p 86-90, 1974.

Descriptors: *DDT, Fish, Absorption, *Pike, *Carp, Toxicity, Lethal limit, Water pollution effects.
Identifiers: Bothriocephalus-Gowkongensis, *Cestodes, Ligula-Intestinalis, *Metabolites(DDT), Triaenophorus-Nodulosus.

The ability of Bothriocephalus gowkongensis, Triaenophorus nodulosus and Ligula intestinalis to rapidly accumulate p,p'-DDT, p,p'-DDD and o,p'-DDD via their fish host (pike, carp) and in vitro was determined. A considerable resistance of cestodes in solutions of the toxicants lethal for their hosts (100 and 1000 micro-g/l) was noted. The ability of cestodes to dechlorinate p,p'-DDT was shown and distinct desorption of p,p'-DDD and its o,p'-isomer from tissues of the 'poisoned' L. intestinalis when placed in a normal Ringer's solution was noted. Preliminary experiments on the effect of p,p'-DDT on yearling carp showed that death among the fish infected with B. gowkongensis was greater than among the uninfected.--Copyright 1975, Biological Abstracts, Inc.
W76-11550

INCREASE OF PRIMARY PRODUCTION IN A BAY OF MALYI ZHEMCHUZHNYI ISLAND (NORTH CASPIAN) USING INORGANIC FERTILIZERS, (IN RUSSIAN),
Kaspiiskii Nauchno-Iseledovatelskii Institut Rynogo Khozyaistva, Astrakhan (USSR).
V. A. Vnukov, G. G. Evstigneev, and V. I. Konev.
Gidrobiol Zh. 10(4), p 90-94, 1974.

Descriptors: *Primary productivity, Bays, *Fertilizers, Inorganic compounds, *Phytoplankton, Lakes, Photosynthesis, Islands, *Phosphates, *Nitrates.
Identifiers: *Caspian Sea, USSR(Zhemchuzhnyi Island), Bay of Malyi.

Experiments in 2 bays on Malyi Zhemchuzhnyi Island (North Caspian) (USSR) showed that the application of superphosphate and ammonium nitrate in the experimental bay changed the quantitative content of biogenous elements in it: the content of phosphate P increased to 63.90 mg/m3 and NH3-N to 62.50 mg/m3 whereas in the control bay these values were, respectively, 22.05 and 47.00 mg/m3. Photosynthetic activity of phytoplankton increased in the experimental bay from 8.23-8.88 and in the control bay from 8.33-8.54. The presence of additional biogenous substances involved a marked increase of the gross primary production of plankton to 10.88 mgO2/l in the experimental bay vs. 0.65-5.07 mgO2/l in control.--Copyright 1975, Biological Abstracts, Inc.
W76-11553

EFFECT OF THE DEGREE OF VACUUM USED IN FILTRATION ON THE SIMULTANEOUS MEASUREMENT OF ASSIMILATION AND EXCRETION BY PHYTOPLANKTON ORGANISMS, (IN FRENCH),
Office de la Recherche Scientifique et Technique Outre-Mer, Abidjan (Ivory Coast). Centre de Recherches Oceanographiques.
A. Herbland.
Cah O R S T O M Ser Oceanogr. 12(3), p 173-178, 1974.

Descriptors: *Filtration, *Phytoplankton, Filters, Vacuum, *Absorption, *Measurement, Coasts, Organic matter, Pollutant identification.
Identifiers: Excretion(Phytoplankton), *Mauritania.

The amount of vacuum applied to draw water through the filter is an important source of error in determining, simultaneously, phytoplankton assimilation and organic excretion. An experiment made in coastal Mauritanian upwelled waters with a natural population, shows that the suction must not exceed 75 mm Hg. The reproducibility of total organic production, assimilation and excretion measurements is not disturbed by increasing suction while the reproducibility of the ration excretion: excretion + assimilation is better with low vacuum. The spatial heterogeneity of phytoplankton cells is an important cause of variability in primary production measurements, while a functional or physiological homogeneity exists in the sub-samples.--Copyright 1975, Biological Abstracts, Inc.
W76-11554

PRIMARY PRODUCTION IN THE MAURITANIAN UPWELLING IN MARCH 1973, (IN FRENCH),
Office de la Recherche Scientifique et Technique Outre-Mer, Abidjan (Ivory Coast). Centre de Recherches Oceanographiques.
A. Herbland, and B. Voituriez.
Cah O R S T O M Ser Oceanogr. 12(3), p 187-201, 1974.

Descriptors: Carbon radioisotopes, *Primary productivity, Organic matter, *Bacteria, Nutrients, *Phytoplankton, Zooplankton, Oxygen, *Chlorophyll, Nitrogen, Coasts, Absorption.
Identifiers: Carbon-14, *Mauritania.

Newly upwelled water was followed with a drogue for 6 days in the Mauritanian upwelling. The particulate organic production was estimated by 3 methods: the increase of chlorophyll a (delta Chla); the increase of particulate C (delta Cp) and the sum of daily C14 primary production. A comparison between these 3 methods shows a regular decrease (100-25) of the ratio Cp/Chla, good agreement between the 2nd and 3rd methods during the morning and a difference for 24 h periods probably due to nightly grazing (between 20-30% of the net

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primary production). The dissolved organic production (phytoplankton excretion) was directly measured and estimated to be 42% of total organic production, but there is evidence of overestimation and it probably did not exceed 20%. The ratio excretion/excretion + assimilation had diel variations with higher values during the afternoon. The nutrient decrease and the chlorophyll a and O2 increase were very important in the morning, but weak or absent in the afternoon. Comparison of dissolved organic P in seawater with direct excretion of phytoplankton and zooplankton seems to show an immediate re-utilization of excreted dissolved organic compounds by heterotrophic bacteria. The atomic ratio of nutrients uptake vs. the C uptake delta C/delta. NO3/delta SiO3/delta PO4 were equal to 60/12/9/1. Silicate was the 1st nutrient deficient. Ammonia is taken up quickly but in small quantity compared to nitrate; nitrite appeared to be marginal in the main N flux. The evolution of O2 distribution cannot be explained by photosynthesis process only; there is evidence of important enrichment by atmospheric exchanges.--Copyright 1975, Biological Abstracts, Inc.
W76-11555

FEATURES OF FRESHWATER ECOSYSTEMS (FROM THE RESULTS OF SOVIET PARTICIPATION IN THE INTERNATIONAL BIOLOGICAL PROGRAM), (IN RUSSIAN),
Akademiya Nauk SSSR, Leningrad. Zoologicheskii Institit.
G. G. Vinberg.
Izv Akad Nauk SSSR Ser Biol. 1, p 83-93, 1975.

Descriptors: *Bacteria, *Ecosystems, Freshwater, Lakes, Reservoirs, *Phytoplankton, *Predation, *Metabolism, Zooplankton.
Identifiers: *International Biological Program(USSR).

Investigations of energy flow in ecosystems of 10 lakes and 2 reservoirs of a different geographical location show a very large range of primary phytoplankton production (P1), 21-1758 kcal.m-2.yr-1. In spite of this the relative production values of bacterioplankton (Pb), non-predatory (P2) and predatory (P3) planktonic and benthic animals vary irregularly around mean values: Pb, 31 (20-46); P2, 10.3 (4.3-16.2) and P3, 49 (20-77). The expenditures for the metabolism of bacterio-, phyto- and zooplankton calculated on the basis of respective production values are in close positive correlation with P1 and, on the average, approach P1.--Copyright 1975, Biological Abstracts, Inc.
W76-11556

A STUDY OF THE QUALITY OF SILK REELING WATER IN REGARD TO SOLUBILITY OF COCOON-SERICIN, (IN JAPANESE),
Ministry of Agriculture and Forestry, Tokyo (Japan). Sericultural Experiment Station.
For primary bibliographic entry see Field 5B.
W76-11557

POSSIBILITY OF USING PHENOLIC RESINS IN HOUSEHOLD AND DRINKING WATER SUPPLY SYSTEMS, (IN RUSSIAN),
Vsesoyunznyi Nauchno-Issledovatelskii Institut Gigieni i Toksikologii Pestitsidov, Kiev (USSR).
Z. S. Tsam.
Gig Sanit. 3, p 117-118, 1975.

Descriptors: *Phenols, *Resins, Potable water, Water supply, Organoleptic properties, Organic compounds, Physicochemical properties.
Identifiers: Formaldehyde, *Phenolic resins.

Specimens of phenolic resins (molding powder K-17-23 and molding material AG-4V) adversely affected the organoleptic and physicochemical indices of household and drinking water quality and released into the water low-molecular-weight organic compounds, including phenol and formaldehyde, in quantities exceeding their maximum allowable concentration in water. Articles made of these phenolic resins are not recommended for use in household or drinking water supply systems.--Copyright 1976, Biological Abstracts, Inc.
W76-11560

THE PATTERNS OF 14C ACCUMULATION AND REMOVAL IN FRESHWATER FISHES, (IN RUSSIAN),
Institute of General and Municipal Hygiene, Moscow (USSR).
G. V. Fedorova.
Zh Obshch Biol 35(4), p 631-639, 1974.

Descriptors: *Carbon radioisotopes, *Distribution patterns, Organic compounds, Inorganic compounds, *Carp, Freshwater fish, Fish pathology.
Identifiers: *Carbon 14, *Loach, *Guppy.

The patterns of accumulation and removal injected 14C both in organic and nonorganic compounds from the water, food, and food and water simultaneously were revealed in the organs and tissues of freshwater fishes (carp, guppy, loach, orfe). Liver, kidneys, gastrointestinal tract, gills, brain were found to accumulate 14C on a large scale. Muscles, skin and eyes accumulate 14C to a smaller extent. A different capacity for accumulation of 14C is observed at subcellular level in the mitochondria. In stomach mitochondria 14C accumulation proceeds much more extensively than in muscle mitochondria. The removal of 14C from the organs and tissues of fishes proceeds much slower as compared with accumulation irrespective of the means of administration.--Copyright 1975, Biological Abstracts, Inc.
W76-11561

MASS DESTRUCTION OF SYNTHLIBORAMPHUS ANTIQUUS BY OIL POLLUTION OF JAPAN SEA,
Niigata Prefecture (Japan). For. Div.
T. Kazama.
Misc Rep Yamashina Inst Ornithol 6(4), p 389-398, 1971.

Descriptors: *Oil pollution, Water birds, Water pollution effects, Oil spills.
Identifiers: Aethia-psittaculus, Brachyramphus-marmoratus, Calonectris-leucomelas, Cerorhinca-monocerata, Destruction, Gavia-artica, Gavia-stellata, *Japan Sea, Larus-argentatus, Lunda-cirrhata, Rissa-tridactyla, Synthliboramphus-antiquus, Uria-lomvia, *Sea birds.

A number of sea birds dead as a result of oil pollution had been found on the beach of Kashiwazaki, Niigata prefecture (Japan) since 1959. The dead birds included S. antiquus, Uria lomvia, Brachyramphus marmoratus, Cerorhinca monocerata, Lunda cirrhata, Aethia psittaculus, Rissa tridactyla, Larus argentatus, Calonectris leucomelas, Gavia stellata and Gavia arctica. Alcids were especially affected by the pollution and the ancient auklet, S. antiguus, was the most usual species. Thirty examples of the auklet were selected for anatomical analysis. They were grouped into 3 categories with respect to body weight and amount of fat and oil attached. The most severely polluted example had an oil weight comprising 50% of the body weight; it had the least fat. Other birds still had some fat. The oil was found even in the digestive tract. Ship oil was being cast offshore in the Japan Sea and was drifting ashore by prevailing winds.--Copyright 1976, Biological Abstracts, Inc.
W76-11562

CONTAMINATION OF THE SEA, (IN SPANISH),
J. Noguera Talar.
Inmersion Cienc 8/9, p 43-46, 1975.

Descriptors: *Sea basses, Fish, Water pollution. Identifiers: Croaker, Gilthead, Sea slug, *Spain, Vegetation, Sheep's head(Fish), *Noise pollution(Water).

The disappearance of fish (sheep's head, gilthead, croaker, seabass, etc.) from shores (Spain), that formerly abounded in these species, was probably caused by the intrusion of man rather than pollution. Pollution may be responsible for the loss of ocean bottom vegetation and such fish food as sea slugs, but illicit dragnetting operations, underwater drilling for petroleum and especially the noise made by motor boats are more destructive. Noise is probably one of the prime factors in driving away fish from certain spots. In areas recently disturbed by man, an abundance of fish is found.--Copyright 1976, Biological Abstracts, Inc.
W76-11564

DETOXICATION IN PLANTS OF TOXIC SUBSTANCES FROM INDUSTRIAL SEWAGE USED FOR IRRIGATION, (IN RUSSIAN),
Central Research Station Agricultural Use of Sewage, Noginsk (USSR).
S. I. Khramova, and K. S. Bokarev.
Fiziol Rast 20(6), p 1257-1260, 1973.

Descriptors: *Water reuse, Aromatic compounds, Sewage, Industrial wastes, Organic compounds, *Toxicity, Irrigation, Carrots, Corn(Field), Grasses, Effluents.
Identifiers: *Aromatic hydrocarbons, *Detoxification(Plants).

Dynamics of the content of aromatic hydrocarbons in soil and in maize, grass and carrot were studied during irrigation with chemical industrial sewage. These compounds were detected in the plants 1-5 days after irrigation, varying according to plant species. Decomposition of these toxic compounds in soil is rather slow--about 10 days after irrigation. The plants are suggested for detoxification of organic contaminants in industrial sewage.--Copyright 1976, Biological Abstracts, Inc.
W76-11567

POLLUTION IN THE EFFLUENTS OF BRACCIANO LAKE AND IN ARRONE STREAM, ON THE BASIS OF THE DISTRIBUTION OF SIMULIIDAE, CHIRONOMIDAE, CULCIDAE AND OTHER DIPTERA, (IN ITALIAN),
Istituto Superiore di Sanita, Rome. (Italy). Laboratori di Parassitologa.
For primary bibliographic entry see Field 5B.
W76-11570

PETROLEUM-OXIDIZING BACTERIA ACCOMPANYING HIGHER AQUATIC PLANTS, (IN RUSSIAN),
N. V. Morozov.
Biol Nauk 17(6), p 94-98, 1974.

Descriptors: *Bacteria, *Aquatic plants, Pseudomonas, Organic compounds, Oil pollution, Physiology, *Bulrushes, *Cattails.
Identifiers: Bacillus, Bacteria, Micrococcus, Planosarcina, Sarcina, Scirpus lacustris, Typha-angustifolia, *Petroleum-oxidizing bacteria.

The species composition of hydrocarbonoxidizing bacteria accompanying the bulrush (Scirpus lacustris) and narrowleaf cattail (Typha angustifolia), which are plants most resistant to high concentrations of petroleum (pollutant), was investigated. The bacteria (32 strains), found in experiments with and without the plants, belonged to the genera Bacillus, Bacterium, Pseudomonas, Micrococcus, Sarcina and Planosarcina. The bacteria accompanying the plants differed in species composition and in the ability to utilize various petroleum hydrocarbons as the sole C source.--Copyright 1976, Biological Abstracts, Inc.
W76-11572

EFFECTS OF ENRICHED DIET WITH IRON IN CULTURE OF YELLOW-TAIL, (IN JAPANESE),
Tokyo Univ. of Fisheries (Japan). Radioisotope Research Lab.
Y. Ikeda, H. Ozaki, and K. Uematsu.
J Tokyo Univ Fish 59(2), p 91-99, 1973.

Descriptors: *Fish diets, *Iron, Proteins, Water pollution effects, Absorption.
Identifiers: Anemia, Erythrocyte, Seriola-quinqueradiata, *Yellow-tail.

The effects of Fe on anemia in yellow-tail (Seriola quinquera-diata) fed on raw fish were studied. The decreasing orders of body weight, erythrocyte count, Hb level, color index and serum protein level after feeding for about 4 mo. were: raw fish > 57.3mg% added Fe > 7.3mg% added Fe.> Although decreasing orders of liver, kidney, spleen, and heart weight were 7.3mg% added Fe > 7.3mg% added Fe > raw fish, the effects of Fe enrichment were observed on the digestive organs. Serum Fe level was highest in a diet with 57.3mg% of Fe, and lowest in 7.3mg% Fe. Absorption of 59 Fe was highest with 7.3mg% Fe and lowest with 7.3mg%. A diet enriched with Fe revealed almost the same Price-Jones curve as that of fish fed on raw fish.--Copyright 1976, Biological Abstracts, Inc.
W76-11573

THE MACROPHYTIC VEGETATION OF RUNNING WATERS IN SOUTH LOWER SAXONY AND THEIR RELATIONS TO WATER POLLUTION, (IN GERMAN),
H-J. Grube.
Arch Hydrobiol Supplementb 45(4), p 376-456, 1975.

Descriptors: Vegetation, Rivers, Streams, Distribution, *Phosphates, *Ammonium, Europe, Soils, Silage, Water pollution.
Identifiers: Callitriche-hamulata, Callitriche-platycarpa, Nasturtium-officinale, Sium-erectum, West Germany(Saxony), *Macrophytes.

The submerged macrophytic vegetation of the rivers and rivulets in South Lower Saxony (West Germany) is described and grouped into 3 communities with different demands on hydrochemical properties, soils and velocity of flow. The distribution of macrophytes shows some correlation with the degree of pollution, especially the NH4 concentration. The reactions of Sium erectum, Nasturtium officinale, Callitriche platycarpa and C. hamulata to different concentrations of NH4, phosphate, dung water and sewage of ensiled beet fibers as typical pollutants of the area were tested in aquarium experiments.--Copyright 1976, Biological Abstracts, Inc.
W76-11574

PHYSICO-CHEMICAL PARAMETERS OF THE HYDROGRAPHIC SYSTEM OF LAKE NANTUA: RELATION WITH OSCILLATORIA, (IN FRENCH),
Station d'Hydrobiologie Continentale, Thonon-les-Bains (France).
J. Feuillade, and A. Orand.
Ann Hydrobiol 5(2), p 95-120, 1974.

Descriptors: Algae, Effluents, Lakes, Water pollution, Sewage, Phosphorus, Nitrates, Light, Physicochemical properties.
Identifiers: *France(Lake Nantua), *Oscillatoria.

Hydrological, meteorological and physico-chemical variations were studied in the influent and effluent of Lake Nantua (France). This work started in May 1969 and was completed in May 1972. After this date half the sewage was diverted from the lake's and conducted to the treatment plant below the lake. The data were converted into the weight of an element carried per second. The study pointed out the existence of sub-lacustrine springs. An increase was observed in the amount of total P input since 1970 (before the building of the sewage pipes). P enrichment of waters by the town is evident, but NO3 is naturally present in these waters. Factorial analysis of correspondances shows that sunlight duration is the main variable controlling the number of algae in the lake.--Copyright 1976, Biological Abstracts, Inc.
W76-11575

PRIMARY PRODUCTION AND BIOTIC BALANCE OF PLANKTON IN THE NORTHEASTERN PART OF THE AMUR BAY, (IN RUSSIAN),
Akademiya Nauk SSSR, Vladivostok. Institut Morskogo Biologii.
I. F. Rassashko.
Okeanologiya. 14(4), p 693-698, 1974.

Descriptors: *Primary productivity, Bays, Respiration, *Phytoplankton, Chlorophyll, Seasonal.
Identifiers: *USSR(Amur Bay), *Biotic balance.

The waters of the NE part of the Amur Bay (USSR) are highly productive. The maximum phytoplankton primary production was about 1000 mgC.M-3/day at a near-shore station and 810 mgC.mg-3/day at a central station. Extremely high assimilation numbers from 57.2-162.0 mgC. mg chlorophyll-1 h were recorded. Primary production is in excess of plankton losses for respiration; the biotic balance of plankton is positive. During 1 yr, primary production varied considerably with minimum in winter and a maximum at the end of summer and in autumn. The differences between the seasons are statistically reliable. A close correlation (R = +0.85) was found between primary production at the surface (X) and below 1 m (Y). The relationship between these 2 values is expressed by the equation y = 1.71 + 3.1 x.--Copyright 1975, Biological Abstracts, Inc.
W76-11576

RELATION BETWEEN GENERATION TIME AND BIOMASS OF PHYTOPLANKTON, (IN RUSSIAN),
Moscow State Univ. (USSR). Dept. of Hydrobiology.
V. D. Fedorov, T. A. Dauba, and T. I. Kol'tsova.
Biol Nauki. 17(5), p 128-136, 1974.

Descriptors: *Biomass, *Phytoplankton, *Cytological studies, Equations.
Identifiers: *USSR(White Sea).

Seasonal variation of the rate of cell division of phytoplankton and the relation between the average values of the generation time found and the average volume of the cells of the individual species were studied. Data on the change of the abundance of individual populations in factorial enrichment experiments set were used for determining generation times. Histograms of the values of the seasonal rates of cell division and the calculated average values of the generation time are given for 28 spp. of phytoplankton of the White Sea (USSR). An equation is given for expressing the relation between the generation time and biomass of phytoplankton.--Copyright 1975, Biological Abstracts, Inc.
W76-11577

THE EFFECTS OF NTA ON THE GROWTH OF PHYTOPLANKTON WITH PARTICULAR CONSIDERATION GIVEN TO IRON AS A MICROELEMENT,
Eidgenoessische Anstalt fuer Wasserversorgung, Abwasserreinigung und Gewaesserschutz, Zurich (Switzerland).
H. Buergi.
Schweiz Z Hydrol. 36(1), p 1-70, 1974.

Descriptors: *Nitrilotriacetic acid, *Iron, *Growth rates, *Phytoplankton, Photosynthesis, Metals, Eutrophication, Lakes, Effluents, Mesotrophy, Water pollution effects, Acids, Trace elements.
Identifiers: Acetic acid, *Switzerland(Lake Lucerne), Switzerland(Greifensee).

While nitrilotriacetic acid (NTA) or Fe may stimulate phytoplankton photosynthesis on a short-term basis in mesotrophic Lake Lucerne (Switzerland), they impede this process in the eutrophic Greifensee. After a few days this reaction tapers off. It is highly unlikely that Fe acts as a growth-limiting factor; the Fe which inevitably gets into lakes through wastewater treatment plant effluents as a result of tertiary treatment (precipitation with Fe3+) will not have a long-term stimulating effect on plankton production. Both Fe-through adsorption-and NTA-through chelation-reduce the supply of free ions of various metals, especially Cu. Since these free ions are needed for plankton growth, and yet have a toxic effect even in small quantities (micro g/l), the medium can, through addition of Fe or NTA, be detoxified or the trace metals limited, with corresponding increase or curtailment of algal production. The different patterns for the 2 lakes can be explained by the influence of natural organic materials on the free ions.--Copyright 1975, Biological Abstracts, Inc.
W76-11578

EFFECT OF TREATED SEWAGE EFFLUENTS ON PHYTOPLANKTON IN LAKES, (IN GERMAN),
Eidgenoessische Anstalt fuer Wasserversorgung, Abwasserreinigung und Gewaesserschutz, Zurich (Switzerland).
P. Bossard, and H. Ambuehl.
Schweiz Z Hydrol. 36(1), p 187-200, 1974.

Descriptors: Water pollution effects, *Sewage effluents, Lakes, *Phytoplankton, *Algae, *Growth rates, Phosphorus, Nitrogen, Iron, Bioassay.

The effect of domestic sewage effluents after mechanical, mechanical-biological and mechanical-biological-chemical treatment on algal cultures and on natural lake phytoplankton was studied by means of laboratory assays and in situ experiments. The concentrations of P and N are almost exclusively responsible for any algal growth. Other constituents which may be present in sewage effluents (e.g.), residual amounts of Fe originating from the tertiary treatment) do not substantially stimulate the growth of algae.--Copyright 1975, Biological Abstracts, Inc.
W76-11579

BIOLOGICAL-PRODUCTIVE INVESTIGATIONS OF ZOOPLANKTON IN THE LAKES AND WATER RESERVOIRS OF THE USSR (GENERAL RESULTS OF THE INTERNATIONAL BIOLOGICAL PROGRAM), (IN RUSSIAN),
Akademiya Nauk SSSR, Leningrad. Zoologicheski Institut.
For primary bibliographic entry see Field 2H.
W76-11581

ABSORPTION AND ACCUMULATION OF PESTICIDES RESIDUES AND CHLORINATED BIPHENYLS IN BOTH WILD AQUATIC VEGETATION AND RICE IN THE CAMARGUE REGION, (IN FRENCH),
Centre National de la Recherche Scientifique, Arles (France). Centre Ecologie Camargue.
A. Vaquer.
Oecol Plant 8(4), p 353-365, 1973.

Descriptors: *Pesticide residues, *Absorption, Algae, *Polychlorinated biphenyls, Deltas, Rice, *DDT, Plant physiology, *Bioindicators, Water pollution, Vegetation.
Identifiers: *France(Rhone delta).

The residues from certain chemicals (pesticides and polychlorinated biphenyls (PCB's) present in relatively small quantities in the various aquatic habitats in the Camargue region (Rhone delta),

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France, were investigated in some aquatic and semi-aquatic plant species, including rice. These plants absorb and concentrate the products (alpha- and gamma- BHC, DDT and PCB's) to levels of 16-20,000 times (dry weight) that of water, varying with the species. The products absorbed are not spread homogeneously throughout the plant but are generally stored at higher levels in the leaves than in the roots and at the base of the stem. The concentrations in the fruit are higher than in the plant itself. Specific differences in concentrations are due to differences in stage of development, absorbing qualities and metabolic activity, particularly degradation. Because of their high accumulating capacity, algae seem to be good indicators of the degree of water pollution.--Copyright 1976, Biological Abstracts, Inc.
W76-11582

SUPERSHRIMP: DEEP BIOTURBATION IN THE STRAIT OF CANSO, NOVA SCOTIA,
McMaster Univ., Hamilton (Ontario). Dept. of Geology.
G. S. Pemberton, M. J. Risk, and D. E. Buckley.
Science, Vol. 192, No. 4241, 21 May 1976, p. 790-791. 2 fig., 5 ref.

Descriptors: Marine animals, *Sediments, *Benthos, *Crustacean, *Oil pollution, *Habitat improvement, Pulp wastes, Industrial wastes, Habitats, Sediment-water Interface, Organic wastes, *Canada, *Shrimp.
Identifiers: *Axius serratus, *Mud shrimp, Burrowing shrimp, *Strait of Canso(NS).

Axius serratus, a crustacean thought to be extremely rare, was discovered in large numbers in polluted regions of the Strait of Canso. The shrimp may live deeper than 3 meters in the sediment; burrows are kept open to at least 2.5 meters. Sediment contained in old filled burrows is anomalous in its distribution of particle size and its content of water, organic carbon, and trace elements. These anomalous qualities affect the geotechnical properties of sediments on the sea floor. (Katz)
W76-11584

LIPID COMPOSITION OF SURFACE FILMS, AND ZOOPLANKTON FROM THE EASTERN MEDITERRANEAN,
Institute of Oceanographic Sciences, Wormley (England).
For primary bibliographic entry see Field 5B.
W76-11585

ECOTOXICOLOGY OF CRUDE OILS AND THE USE OF EXPERIMENTAL MARINE ECOSYSTEMS,
Museum National d'Histoire Naturelle, Paris (France). Laboratoire de Physiologie Generale et Comparee.
J. C. Lacaze.
Marine Pollution Bulletin, Vol. 5, No. 10, 1974, p. 153-156, 3 fig., 4 ref.

Descriptors: *Ecology, *Toxicity, *Bioassay, *Methodology, *Ecosystem, *Laboratory system, *Laboratory tests, *Oil, Oily water, *Oil pollution, Water pollution, Water temperature, Primary productivity, Pollutant identification.
Identifiers: *Crude oil, *Kuwait crude, Controlled ecosystem.

Ecotoxicological investigations are generally undertaken in the laboratory on some constituents of ecosystems. The complementary synthetic aspect, comprising the analysis of the overall effect of a pollutant on an ecosystem, also falls within the framework of the science of pollution. Study of the effects of a crude Kuwait oil on the primary production of experimental ecosystems is described. (Katz)
W76-11586

ORGANIC POLLUTION IN ENSENADA BAY, MEXICO,
Centre d' Oceanographie, Marseille (France). Station Marine d'Endoume.
For primary bibliographic entry see Field 5B.
W76-11587

REDUCTION OF FIELD POPULATIONS OF FIDDLER CRABS BY UPTAKE OF CHLORINATED HYDROCARBONS,
Marine Biological Lab., Woods Hole, Mass.
Boston Univ. Marine Program.
C. T. Krebs, I. Valiela, G. R. Harvey, and J. M. Teal.
Marine Pollution Bulletin, Vol. 5, No. 9, 1974, p. 140-142, 3 tab., 24 ref.

Descriptors: *Chlorinated hydrocarbon pesticides, *Polchlorinated biphenyl, *DDE, *Sewage sludge, *Bioassay, *Crabs, Behavior, *Aldrin, *Dieldrin, Crustaceans, Fertilzers, *Massachusetts, Marshes, *Salt marshes.
Identifiers: *Great Sippewissett marsh(Mass), West falmouth(Mass), Fiddler Crabs, Uca pugnax

Fiddler crabs are particularly sensitive to chlorinated hydrocarbons. Crabs that have been feeding on contaminated material show an impairment of their escape reaction. High concentrations of Aldrin and Dieldrin in plots of marsh experimentally treated with contaminated sewage sludge indicate that these insecticides are responsible for a drastic reduction in fiddler crab populations. (Katz)
W76-11588

ANTIMICROBIAL-RESISTANT COLIFORMS IN NEW YORK BIGHT,
Montclair State Coll., Upper Monclair, N. J. Dept. of Biology.
L. K. Koditschek, and P. Guyre.
Marine Pollution Bulletin, Vol. 5, No. 5, 1974, p. 71-74, 1 tab., 1 fig., 23 ref.

Descriptors: Water pollution effects, *Marine bacteria, *Marine microorganisms, *Sewage bacteria, *Sewage pollution, *Coliforms, *Enteric bacteria, *Sewage sluge, *Heavy metals, Atlantic Ocean, Public health, Sediments, Sludge disposal, New York.
Identifiers: *New York Bight, Antimicrobial-resistant coliforms, Heavy metal resistant coliforms, Antibiotic resistance.

A preliminary study of sediments and overlying water samples obtained at the approximate center of the sewage sludge bed in the New York Bight, revealed significant numbers of coliforms resistant to antibiotics and heavy metals. Some of the isolates were shown to transfer antibiotic resistance during conjugation with a recipient strain of Salmonella gallinarum. The selection of bacterial populations resistant to antimicrobials may be significant in the ecology of this improverished area, and requires further study. (Katz)
W76-11590

EFFECTS OF CRUDE OIL AND DISPERSANTS ON BI-VALVES,
American Univ., Beirut (Lebanon). Dept. of Biology.
R. J. Avolizi, and M. Nuwayhid.
Marine Pollution Bulletin, Vol. 5, No. 10, p. 149-153, 1974. 1 tab., 2 fig., 30 ref.

Descriptors: Oil, *Oil pollution, *Oily water, *Toxicity, *Bioassay, Methodology, *Respiration, Mortality, *Mollusks, Mussel, Waste water disposal, Detergents, Laboratory analysis.
Identifiers: *Crude oil, *Dispersants, *Corexit 7664, Sub-lethal concentration, Respiration rate, *Arabian crude oil.

The toxic effects of crude oil, the dispersant Corexit 7664, and mixtures of these on the respiration and mortality of two species of bivalve have been examined. A light Arabian crude is most toxic to one, Corexit is most toxic to the other. The susceptibility to oil of the mussel Brachidontes is also reflected in a significant depression of respiration rate at sub-lethal concentrations. (Katz)
W76-11591

TOXICITY OF OIL-SINKING AGENTS,
Ministry of Agriculture Fisheries and Food, Burnham-on-Crouch (England). Fisheries Lab.
R. A. R. Blackman.
Marine Pollution Bulletin, Vol. 5, No. 8, 1974, p. 116-118, 1 tab., 2 fig., 5 ref.

Descriptors: *Oil pollution, *Oily waters, *Toxicity, *Bioassay, *Morality, *Shrimp, *Oil spills, *Organic compounds, Disaster, Waste water disposal, Marine animals.
Identifiers: Wetting agents, Ethylene glycol, Armac T, Solvents, Isopropyl alcohol, Geramin TA200A, 2-Butoxy ethanol, 50% mortality, Marine pollution.

It may be necessary to immobilize an oil spill of more than 10,000 tons in European waters by sinking with sand. The possibility of damage to marine organisms from the sinking agents used has been investigated and it is concluded that toxic effects are unlikely to result. (Katz)
W76-11592

FLUORIDE IN MARINE ANIMALS,
Newcastle-upon-Tyne Univ. (England). Dept. of Plant Biology.
D. A. Wright, and A. W. Davison.
Marine Pollution Bulletin, Vol. 5, No. 8, 1974, pp. 119-121, 3 tab., 11 ref.

Descriptors: *Fluorides, *Marine animals, *Industrial effluents, Birds, Fish, *Invertebrates, *Food chains, Commercial fish, *Shrimps, Water pollution, Aluminum, Path of pollutants, Public health.
Identifiers: Cod, Haddock, Aluminum smelter, Tissue concentration, Flounders, Sprat, Northumberland coast.

Fluoride in a greatly diluted form is part of the effluent from an aluminum smelter on the Northumberland coast in north-east England. Fluoride is concentrated in the skeleton of birds, fish and in vertebrates and to a smaller extent in the skin of fish. All concentrations found both in the seawater and in local animals are within the normal range and it is unlikely that the additions from the smelter materially affect the situation. Since fluoride concentrates in inedible tissues there appears to be little health risk from this source in seafood. (Katz)
W76-11593

MIDSUMMER METABOLISM OF AN EEL GRASS COMMUNITY,
Georgia Univ., Athens. Dept. of Botany.
J. R. Suda.
Marine Pollution Bulletin, Vol. 5, No. 10, 1974, p. 156-159, 1 tab., 3 fig., 7 ref.

Descriptors: *Intertidal areas, *Littoral, *Shoreline cover, *Rooted aquatic plant, *Metabolism, *Succession, *Respiration, Beaches, Aquatic environment, Aquatic plant, *New York, *Halophytes, Submerged plant, Growth stages, Photosynthesis, Physiological ecology.
Identifiers: *Zostera, *Eel grass, *Long Island(NY), Eelgrass community metabolism, Eelgrass community organisms, Great South Bay.

Eelgrass (Zostera marina) is the dominant member of an important intertidal ecosystem found in many parts of the world. In this preliminary study the metabolism of the entire eelgrass community

luding epiphytic plants and other organisms, been measured in Great South Bay on Long and, New York. In July it is in equilibrium and sumes as much oxygen as it produces, but in gust both photosynthesis and respiration are uced, with a net increase in oxygen production. s is due largely to the rapid growth of epiphytes ing that month. (Katz)
6-11594

H CULTURE IN WARMED WATERS IN E CZECHOSLOVAK SOCIALIST REPUBLIC IOV RYB V OTEPLENYCH VODACH V SKOSLOVENSKE SOCIALISTICKE PUBLICE),
kumny Ustav Rybarsky a Hydro-biologicky, nany (Czechoslovakia).
Krupauer.
etin VURH, Fisheries Research Institute, nany, Vol. XI, No. 4, p. 3-6, 1975, 5 ref.

criptors: *Aquiculture, Commercial fish, ated waters, *Growth rates, *Fish farming, clear powerplants, *Thermal water, *Fish oduction, *Carp, Nuclear energy, *Thermal ition, Temperature, Water pollution effects, rmal stress.
tifiers: *Czechoslovakia.

possibilities of fish culture in warmed waters discussed with mention made of the use in choslovakia of waters warmed by nuclear er stations. These waters are designed to be for the control of spawning in economically rtant fishes through a transient breeding of nt material in warmed water, for early fry ng in this environment, and for carp fry rear- the age of one year in order to produce stock capable of reducing the time required to reach et weight to two years. (Katz)
11595

OMPARISON OF THE ABUNDANCE AND RSITY OF FOSSIL PIGMENTS IN WET- D PEATS AND WOODLAND HUMUS ERS,
Wesleyan Univ., Delaware. Dept. of Botany acteriology.
Sanger, and E. Gorham.
gy. 54(3), p 605-611, 1973.

iptors: *Chlorophyll, *Humus, Lakes, Wet- *Pigments, Peat, Mosses, Bogs, Swamps, sediments, Bioindicators, Decomposing or- matter.
fiers: *Carotenoids, Woodland humus , Fossil pigments.

bundance and diversity of fossil pigments ophyll derivatives and carotenoids) in and humus layers and in circumneutral to ately acid swamp peats were shown to in- with degree of soil waterlogging. The peats are distinctly richer in pigments than highly acid peats from a Sphagnum bog, ally as regards carotenoids. However, the d swamp peats exhibit equal pigment diver- lthough the semi-aquatic swamp peats are and more diverse in fossil pigments than ter- humus layers, they are much poorer and ess diverse than profundal lake sediments. bination of low pigment concentrations, te pigment diversity, and high ratios of phyll derivatives to carotenoids was useful dicator of swamp invasion in the course of ne evolution.--Copyright 1973, Biological cts, Inc.
601

AND HEAVY METAL CONTENT OF CROPS GROWN ON SOILS AMENDED SEWAGE SLUDGE,
nia Univ., Riverside.
nary bibliographic entry see Field 5D.
510

FINE PARTICLES AND WATER QUALITY IN THE COASTAL MARINE ENVIRONMENT,
State Univ. of New York at Stony Brook. Marine Sciences Research Center.
For primary bibliographic entry see Field 5B.
W76-11612

OBSERVATIONS ON THE CESTODE EUBOTHRIUM SALVELINI IN JUVENILE SOCKEYE SALMON (ONCORHYNCHUS NERKA) AT BABINE LAKE, BRITISH COLUMBIA,
Fisheries and Marine Service, Nanaimo (British Columbia). Biological Station.
H. D. Smith.
J Fish Res Board Can. 30(7), p 947-964, 1973.

Descriptors: *Sockeye salmon, Lakes, *Canada, *Smolt, Plankton, *Fish diseases, *Fish parasites, Fish growth, Fish behavior, Zooplankton.
Identifiers: Cestode, Eubothrium-salvelin, Oncorhynchus-nerka, *Babine Lake(BC).

Infection incedence among 15 brood years of smolts in the period 1952-71 was estimated from smolt and underyearling samples, and among late run fish from the main part of Babine Lake (Canada) ranged from 6-45% (average 26%). In early run fish from the North Arm-Nilkitkwa area it ranged from 5-46% (average 22%) in 10 yr during 1958-71. Infection intensity changed substantially during 1967; but about 1 fish in 8 or 200,000 individuals in the early run, carried parasite loads greater than or equal to 10% of fish weight. Mature E. salvelini (Schrank 1790) averaged 32 mg in weight and 34 mm in length during a period of high incidence and intensity of infection 1967. Although no proof was found of direct mortality caused E. salvelini, indirect effects such as inferior growth, poor swimming performance, or aberrant behavior due to large cestode loads may increase host susceptibility to death from other causes. Changes in relative abundance of the zooplankton intermediate host, and midsummer shifts in feeding preferences of young sockeye likely account for increasing infection incidence in June and July, and stable incidence thereafter.--Copyright 1973, Biological Abstracts, Inc.
W76-11624

5D. Waste Treatment Processes

FRAGIPAN STABILITY IN SOIL-PLANT EFFLUENT DISPOSAL SYSTEMS,
Missouri Univ., Columbia. Dept. of Agronomy.
For primary bibliographic entry see Field 2G.
W76-11104

CONTINUED STUDIES (PHASE II) IN THE SEARCH FOR A PREDICTIVE MODEL FOR SLUDGE CHARACTERIZATION USEFUL TO DESIGN AND CONTROL OF SLUDGE DEWATERING PROCESSES IN WATER RECYCLE SYSTEMS,
Maine Univ., Orono. Land and Water Resources Inst.
E. G. Bobalek, R. E. Durst, B. Yadeta, and B. A. Cook.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-256 237, $5.00 in paper copy, $3.00 in microfiche. Report No. 5-75, June 1975. 76 p, 11 fig, 15 tab, 12 ref, 3 append. OWRT B-009-ME(1). 14-01-0001-4089.

Descriptors: *Sludge treatment, *Sewage sludge, *Dewatering, Model studies, Filtration, *Kinetics, Recycling, Waste water treatment, Waste treatment, Waste identification, Correlation analysis.
Identifiers: *Sludge dewatering, Sludge handling, Dewatering model, Sludge aging.

Phase II of continuing studies to develop a predictive model for sludge characterizations was directed toward: (I) Exploring the value of the model that relates filterability to one static chemical parameter (the bound water) for complex sludges; and (II) Replacing the exacting and tedious experimental methods developed earlier for data retrieval with more convenient procedures. The goal of greater experimental convenience was achieved by (A) Replacing the laboratory filter cell system with a pilot plant scale rotary filter; and (B) Replacing the vapor pressure isotherm method for bound water measurement with a convenient instrumental method that senses relative humidity over a single sample of progressively-dried sludge cake. The goal of extending or improving the original quantitative model to make filterability predictions was frustrated when physicochemical aging effects of the complex sludges were observed. It became apparent that detailed knowledge of how hydrodynamic parameters depend upon sludge chemistry was necessary. Thus the original correlation model which ignores aging kinetics was found to be too simple for general use. However, a new laboratory method was developed which can track short and long term kinetics for most sludges provided proper sampling is conducted. (See also W74-10528) (Hutchins-Maine)
W76-11116

MUNICIPAL WASTES AS A FERTILIZER SOURCE,
Nebraska Univ., Lincoln. Dept. of Agricultural Engineering.
J. R. Gilley.
Available from NTIS Springfield, Va., 22161, as PB-256 206, $3.50 in paper copy, $3.00 in microfiche. Journal Series Paper No. 5042, University of Nebraska Agricultural Experiment Station, presented at 1976 Sprinkler Irrigation Association Technical Conference in Kansas City, February 24, 1976. (1976). 14 p, 2 fig, 4 tab, 14 ref. OWRT A-041-NEB(1). 14-34-0006-6028.

Descriptors: *Municipal wastes, Sludge, Effluents, Fertilizers, *Organic wastes, Land management, Application rates, Crop production
Identifiers: *Land application.

Municipal sewage wastes, sludges and effluents can be used on land for crop production with benefits for both agricultural and urban interests, but the waste and the land must be carefully managed to achieve favorable results. Successful land utilization of municipal wastes for crop production requires the usual basic soils, climate and crop information. However, because of the nature of the material being placed on the land and public reaction to it, soil-plant management information becomes even more important. The objective in many waste application systems is to maximize waste application to the land while preventing environmental contamination and in addition to produce an acceptable crop yield. Accomplishing this often requires considerable adjustments from the usual crop and soil management practices. Organic wastes can be used safely and effectively to increase soil productivity if proper precautions are taken concerning heavy metals, toxic chemicals, nitrate leaching, erosion losses and undesirable odors. When applied at crop use rates and with proper soil management, most municipal wastes present no serious environmental hazards and should be considered a resource that agriculture can very well use.
W76-11117

HYDRAULIC COLLECTION AND DISPOSAL OF REFUSE,
Meta Systems, Inc., Cambridge, Mass.
J. Kuhner, and P. M. Meier.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, Vol. 102, No. EE4, Proceedings paper 12296, p 769-788, August 1976. 4 fig, 5 tab, 21 ref.

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Descriptors: *Solid wastes, *Systems analysis, *Sewage treatment, Simulation analysis, Mathematical models, Hydraulics, Sludge disposal, Management, *Waste water treatment.
Identifiers: *Cost effectiveness, Refuse, *Refuse disposal, Wet system.

A concept for residential refuse management is examined that calls for individual household refuse grinders, dilute slurry transport of ground refuse in the existing sanitary sewer system, and joint treatment of refuse and sewage at an expanded treatment facility that includes anaerobic digestion for methane generation. Hydraulic transport of ground refuse in existing sewer systems may be feasible only if both metals and glass are excluded, and a conventional collection of the nongrindable and bulky constituents of residential refuse will still be needed. The total 1973 cost of such a wet system is estimated at between $110 and $200 per household per year, of which $80-$105 is used for grinding. This compares to a total cost for sewage and refuse collection and disposal under existing concepts of $40-$115 per household per year. If the cost of the grinder is excluded (individuals would purchase grinders), the 1973 wet system costs to the public sector would be on the order of $30-$90. (Bell-Cornell)
W76-11138

ESTIMATES OF INDUSTRIAL WATERBORNE RESIDUALS CONTROL COSTS: A REVIEW OF CONCEPTS, METHODOLOGY, AND EMPIRICAL RESULTS,
Johns Hopkins Univ., Baltimore, Md.
For primary bibliographic entry see Field 5G.
W76-11160

REMOVAL OF ALGAE FROM WASTE STABILIZATION POND EFFLUENT,
Mississippi State Univ., Mississippi State Dept. of Civil Engineering.
M. T. Bond.
Available from the National Technical Information Service, Springfield, Va., 22161 as PB-256 512 $4.50 in paper copy, $3.00 in microfiche. Mississippi Water Resources Research Institute, Mississippi State, Completion Report July 1976. 56 p, 19 fig, 6 tab, 22 ref, 4 append. OWRT A-096-MISS(1).

Descriptors: Ponds, Lagoons, Waste treatment, *Algae, *Oxidation lagoons, Effluents, Sludge Polyelectrolytes, *Waste water treatment, Kinetics.
Identifiers: *Alum treatment.

The objectives were: (1) To determine the variances of selected parameters for waste stabilization pond effluents treated with alum alone and with alum used with polyelectrolytes and (2) To determine the sludge volume and characteristics produced in the physical-chemical process. In addition, the use of lime in place of alum was studied. Effluents were collected for four sampling conditions and treated in the laboratory to determine chemical requirements and sludge characteristics. Alum requirements were in the range of 60 to 100 mg/l while lime (Ca(OH)2) requirements varied from 250 to 600 mg/l. Various polyelectrolytes were tried and produced fair results when cationic polymers were used in concentrations greater than 15 mg/l. The results from chemical-polymer systems were only a little better than those using chemicals only. An equation has been proposed that relates alum sludge volume produced to suspended solids removed. The sludge was found to separate rapidly and to be thickened to a significant degree by gravity. Results of the traditional specific resistance to filtration and the filter leaf tests indicate that vacuum filtration of the sludge would not be effective. A possible exception may be precoat filtration of lime sludge.
W76-11171

INHIBITION OF NITRIFICATION BY AMMONIA AND NITROUS ACID,
Monteco Environmental Management Associates, Montgomery, N.Y.
A. C. Anthonisen, R. C. Loehr, T. B. S. Prakasam, and E. G. Srinath.
Journal Water Pollution Control Federation, Vol. 48, No. 5, p 835-852, May, 1976. 15 fig, 4 tab, 24 ref.

Descriptors: *Nitrification, *Inhibitors, *Inhibition, *Ammonia, *Nitrogen fixing bacteria, Waste treatment, Temperature, Microorganisms, Municipal wastes, Industrial wastes, Farm wastes, Soils, Fertilizers, Chemical reactions, *Waste water treatment, Nitrites.
Identifiers: *Nitrous acid, Nitrifiers.

The inhibitory effects of ammonia and nitrous acid on nitrification, a process which may occur during waste treatment, were investigated. Nitrification inhibition was correlated with free ammonia and free nitrous acid concentrations but not with total ammonia or nitrite ion concentrations. The free ammonia concentrations required for the inhibition of nitrosomonads and nitrobacters were 10-150 mg/liter and 0.1-1.0 mg/liter, respectively. Inhibition of nitrifying organisms by free nitrous acid was initiated at concentrations between 0.22 and 2.8 mg/liter. Factors affecting the inhibition of nitrification by free ammonia and free nitrous acid included acclimation of the nitrifiers to the inhibitors, temperature, and the number of active nitrifying organisms. Free ammonia and free nitrous acid inhibition of nitrification occurs in municipal, industrial, and agricultural wastes as well as with fertilizers in the soil. (Kreager-FIRL)
W76-11197

AWT ENERGY NEEDS A PRIME CONCERN,
Orange County Water District, Fountain Valley, Calif. Board of Directors.
D. G. Argo, and G. M. Wesner.
Water and Wastes Engineering, Vol. 13, No. 5, p 24-26, 77, May, 1976. 2 fig, 1 tab.

Descriptors: *Waste water treatment, *Tertiary treatment, *Treatment facilities, *Energy budget, Adsorption, Filtration, Chlorination, Pumps, Equipment, Reverse osmosis, Facilities, Recycling, *Treatment facilities, Desalination.

Primary and secondary energy requirements are outlined for an advanced design waste water treatment plant designed to treat 15 million gallons/day of trickling filtered secondary effluent by chemical clarification with lime, ammonia stripping, recarbonation, mix-media, filtration, carbon adsorption, and chlorination. Energy consumptions for the influent pump station, the chemical clarification system, ammonia removal towers, the recarbonation basin, the filtration system, activated carbon adsorption, and chlorination are 2688, 842, 27,988, 4370, 412, 3566, and 91 kilowatt-hours/day, respectively. A reverse osmosis system is being installed to demineralize one-third of the plant's flow and is expected to consume about 35,000 kilowatt-hours/day. Detailed diagrams of the reclamation plant and the reverse osmosis section are presented. (Kreager-FIRL)
W76-11198

THE SIGNIFICANCE OF PORE DIFFUSION TO FILTER DENITRIFICATION,
Technical Univ. of Denmark, Lyngby. Dept. of Sanitary Engineering.
P. Harremoes.
Journal Water Pollution Control Federation, Vol. 48, No. 2, p 377-388, February, 1976. 9 fig, 1 tab, 15 ref.

Descriptors: *Denitrification, *Filters, *Design criteria, *Mathematical models, *Kinetics, Waste treatment, Chemical reactions, Physical properties, Biological treatment, Pores, Diffusion, Waste water treatment, Filtration.
Identifiers: *Filter denitrification.

The kinetics of filter denitrification are reviewed and a mathematical expression relating pore diffu sion to filter denitrification is developed. An ex pression for a bulk half-order reaction based o zero-order heterogeneous reactions in a por which is only partly penetrated by the substrate i found to be suitable for simulating filter denitrifi cation. The applicability of the theory is demon strated by a comparison with filter concentratio profiles and with the half-order bulk reaction rat per unit filter surface. Values of the half-orde bulk reaction rate ranging over 4 orders of mag nitude are demonstrated for differences in medi type and size, porosity, specific surface, residen time, scale of experiment, and temperature. Th design of denitrification filters with respect to cho ice of media and residence time is shown possib by selection of the proper reaction rate. (Kreage FIRL)
W76-11199

A FORCED AERATION SYSTEM FOR COM POSTING WASTEWATER SLUDGE,
Agricultural Research Service, Beltsville, M
Biological Waste Management and Agricultu Research Service, Beltsville, Md. Soil Nitrog Lab.
For primary bibliographic entry see Field 5E.
W76-11200

RESPONSE OF ACTIVATED SLUDGE T QUANTITATIVE SHOCK LOADING,
Weston (Roy F.), Inc., Wilmette, Ill.
P. Krishnan, and A. F. Gaudy, Jr.
Journal Water Pollution Control Federation, V 48, No. 5, p 906-919, May, 1976. 9 fig, 3 tab, 16 r

Descriptors: *Activated sludge, *Waste wa treatment, *Feeding rates, Performance, Eval tion, Treatment facilities, Equipment, Treatme Organic loading.
Identifiers: Quantitative shock loading, Substr leakage.

The effect of quantitative shock loading, ministered as a step increase in feed concent tion, on both once-through and cell recycle tivated sludge systems was investigated for v ous hydraulic reactor detention times. As the tention time was increased, there was generally improvement in system response with regard the amount of substrate leakage during transient phase at a given shock concentration substrate. This trend was most readily observe the once-through systems, although it was seen in the cell recycle systems at high sh levels. Cell recycle operation appeared to h some beneficial effect with regard to transient strate leakage at the 3000 mg/liter level; howe a 5000 mg/liter shock level exceeded the abilit the cell recycle program to attenuate subst leakage over that observed in the once-thro system. The results indicate that activated slu systems may be expected to accommodate a 2 increase in feed concentration with little or no strate leakage in the transient phase. (Krea FIRL)
W76-11201

FOLKLORE IN THE DESIGN OF FINAL S TLING TANKS,
Delaware Univ., Newark. Dept. of Civil Engi ing.
R. I. Dick.
Journal Water Pollution Control Federation, 48, No. 4, p 633-644, April, 1976. 3 fig, 30 ref.

Descriptors: *Sedimentation, *Settling ba *Activated sludge, *Waste water treatm *Design criteria, Retention, Rates, Performa Evaluation, Treatment facilities, Equipm Flotation, Phosphorus, Settling velocity.
Identifiers: *Settling tanks.

npirical parameters which have been found use-
l in the past for describing the performance of
al settling tanks in activated sludge processes
e evaluated in light of current knowledge on the
bject. Stipulation of some maximum overflow
e and minimum retention time seems reasona-
, but only for a description of the clarification
ıction of the tank. These parameters completely
regard the thickening function of the tank. The
e of sludge volume index as a basis for estimat-
the concentration of return sludge to be ex-
cted from a final settling tank appears
estionable because it does not take into account
designer's and the operator's ability to alter the
formance of final settling tanks to achieve a
ge of return sludge concentrations. The con-
t that solids retention time must be minimized
final sedimentation tanks does not seem well
nded except as it relates to the possible flota-
of sludge caused by denitrification and to the
ase of phosphorus from sludges. The popular
that overflow rates in final sedimentation
cs should be selected to be equivalent to the
ling velocity of the mixed liquor is theoretically
rrect and may result in inaccurate sedimenta-
tank design. (Kreager-FIRL)
5-11202

E- VERSUS TWO-STATE NITRIFICATION THE ACTIVATED SLUDGE PROCESS,
ahoma State Univ., Stillwater. School of Civil
ineering.
. Stover, and D. F. Kincannon.
rnal Water Pollution Control Federation, Vol.
No. 4, p 645-651, April, 1976. 6 fig, 17 ref.

criptors: *Nitrification, *Activated sludge,
ste water treatment, *Kinetics, Sludge
osal, Costs, Alkalinity, Acids, Evaluation,
ormance, Laboratory tests.
tifiers: Nitric acid, Literature reviews.

terature search and laboratory experiments
performed to evaluate the relative merits of
versus two-stage nitrification in activated
ge processes. Both one- and two-stage
ms were found capable of achieving complete
ication and a high level of carbon removal.
operational difference between the two
esses was simply the value of the limiting
cell residence time or growth rate. The limit-
ean cell residence time for complete nitrifica-
vas six days for the two-stage process and ten
for the one-stage process. The one-stage
ss appears to offer some advantages if sludge
sal presents a difficult or costly problem and
requires one clarifier. However, nitrification
be possible in a two-stage process when it is
ossible in a one-stage system. A problem en-
ered in both the one- and two-stage
sses is pH reduction by the production of
acid. If insufficient alkalinity is present in
vaste water, the one-stage system and the
cation reactor of the two-stage system will
e pH adjustment. (Kreager-FIRL)
11203

BIC THERMOPHILIC TREATMENT OF STRENGTH WASTEWATERS,
e East Technical Univ., Ankara (Turkey).
of Environmental Engineering.
Surucu, E. S. K. Chian, and R. S.
brecht.
l Water Pollution Control Federation, Vol.
. 4, p 669-679, April, 1976. 7 fig, 1 tab, 29

ptors: *Waste water treatment, *Aerobic
ent, *Thermophilic bacteria, *Organic com-
s, Activated sludge, Chemical oxygen de-
Rates, Kinetics, Temperature, Respiration,
ncies, Performance, Feasibility.
iers: *Aerobic thermophilic treatment.

asibility of using aerobic thermophilic treat-
modification of the conventional activated
sludge process, for purifying waste waters with high concentrations of organic matter was evaluated using a single-stage, isothermal, completely mixed, continuous-flow reaction system. The thermophilic system proved capable of treating waste water with a high organic content in less time than that required for mesophilic systems and produced less sludge. Over 90% removal of soluble chemical oxygen demand was observed with a sludge retention time of 2 days. The percentage removal of chemical oxygen demand increased with increasing sludge retention times. The theoretical air requirements for thermophilic systems are expected to be slightly higher (14%) than for mesophilic systems because of the higher rate of endogenous respiration at elevated temperatures. (Kreager-FIRL)
W76-11204

DEBATE GROWS OVER WATER PURIFICATION METHODS.
For primary bibliographic entry see Field 5F.
W76-11205

EQUIPMENT APPLICATIONS IN WASTEWATER TREATMENT CLARIFIERS,
FMC Corp., Itasca, Ill. Environmental Equipment Div.
J. C. Lodholz, and H. Pentz.
Public Works, Vol. 107, No. 6, p 97-100, June, 1976. 4 fig.

Descriptors: *Waste water treatment, *Treatment facilities, *Mechanical equipment, *Separation techniques, *Settling basins, Flotation, Sludge, Scum.
Identifiers: *Clarifiers.

Gravity separation in primary and secondary clarifiers is generally confined to settling tanks except where industrial wastes susceptible to flotation are present. The chain and flight collector, most commonly used in primary clarifiers, consists of two strands of chain carrying flights at about 10 ft intervals and removes both sludge and scum. Rectangular basins may also be equipped with a travelling bridge, which traverses the length of the basin and carries a scraper blade along the bottom to collect sludge and, on the return run, along the surface for skimming. Collection mechanism for circular tanks have rotating skimming blades for scum and rotating scraper blades for sludge. Primary sludge collectors with skimmers also require discharge devices, which may be operated manually or automatically, periodically or continuously. A stirring mechanism is required if flocculants are used; separate chambers or the same chamber may be used for mixing and flocculation. Tube settlers are used in advanced waste treatment; sludge normally leaves them by gravity. The frequency of sludge withdrawal and scum removal vary for different plants, but a schedule can be established for a particular plant. Mechanical parts of skimmers and sludge collectors should be checked regularly to determine whether maintenance is required. (Snyder-FIRL)
W76-11206

LAND TREATMENT OF MUNICIPAL WASTEWATER,
Metcalf and Eddy, Inc., Palo Alto, Calif.
R. W. Crites, and C. E. Pound.
Environmental Science and Technology, Vol. 10, No. 6, p 548-551, June, 1976. 1 fig, 2 tab, 6 ref.

Descriptors: *Waste water treatment, *Treatment facilities, *Land use, Effluents, Tertiary treatment, Costs, *Infiltration rates, Soils, Irrigation, Water quality, Water management(Applied), *Overland flow.
Identifiers: *Rapid infiltration.

Land treatment and advanced treatment of waste water are economically competitive in many cases and produce effluents of generally comparable quality. The three major types of land treatment, slow-rate, rapid infiltration, and overland flow, are compared. Land treatment removes organics, nitrogen, and some phosphorus, but exchangeable cations and trace elements can cause problems in some soils. In certain cases, municipal waste water should be treated before land application. For a given type of land treatment, the quality of the effluent that can be attained is nearly the same whether untreated, primary, or secondary waste water is applied. Bakersfield, California; Tallahassee, Florida; and San Angelo, Texas all use slow-rate land application to irrigate cropland. Rapid infiltration of waste water that has received secondary treatment is used in Lake George, New York, and Phoenix, Arizona. Overland flow of treated waste water is used in Ada, Oklahoma, and Melbourne, Australia. The costs of land treatment can compare favorably with those of conventional treatment and discharge systems. With proper management and monitoring, land treatment can compete with advanced waste water treatment in many locations in terms of renovated water quality and water and nutrient resource management. (Snyder-FIRL)
W76-11207

COMPARATIVE EFFECTS OF CHEMICAL PRETREATMENT ON CARBON ADSORPTION,
Municipal Environmental Research Laboratory. Cincinnati, Ohio.
J. J. Westrick, and J. M. Cohen.
Journal Water Pollution Control Federation, Vol. 48, No. 2, p 323-338, February, 1976. 18 fig, 4 tab, 18 ref.

Descriptors: *Waste water treatment, *Treatment facilities, *Adsorption, *Activated carbon, *Pilot plants, Filtration, Effluents, Phosphorus, Organic matter, Suspended solids, Pre-treatment(Water).
Identifiers: Physico-chemical treatment, *Chemical pre-treatment.

Three physico-chemical pilot plants were operated for a period of nearly 11 mo with three distinctly different chemical clarification schemes preceding identical granular activated carbon and filtration systems. All produced effluents with low concentrations of phosphorus, organics, and solids. A data analysis method was developed that permits simplistically comparing carbon dosages required for given effluent qualities. Superior organic removal was provided by the iron coagulant in clarification-filtration pretreatment, yielding the lowest estimated cost for a carbon system to produce any effluent quality studied. These estimates include only the carbon process, with regeneration, and exclude other total system costs. These results obviously are specific to the waste type and conditions of operation. Although small differences in performance were observed for the three systems, all produced effluents in essentially the same range of quality. (Snyder-FIRL)
W76-11209

THE EXTENSION OF THE SEWAGE-TREATMENT PLANTS OF STUTTGART (DER AUSBAU DER STUTTGARTER KLARWERKE).
W. Haydt.
Forum Umwelt Hygiene, Vol. 27, No. 5, p 167-173, 1976. 20 fig.

Descriptors: *Waste water treatment, *Sewage treatment, *Biological treatment, *Treatment facilities, *Biochemical oxygen demand, Sewerage, Europe, Sludge treatment.
Identifiers: Stuttgart(Germany).

The catchment area of the city of Stuttgart, Germany, covers 265 sq km. The central sewage treatment works and three smaller treatment plants in the suburbs needed enlargement due to new design criteria, improved storm water treatment, and environmental protection. In all these treatment plants the biological treatment and sludge treat-

UNIVERSITY OF ILLINOIS URBANA-CHAMPAIGN

ment were improved and enlarged in two sections. Total costs were approximately 50 million DM. In 1978, the effluent biochemical oxygen demand (BOD) should be below 20 mg BOD/liter. Some research investigations are being conducted utilizing tertiary treatment to produce an effluent BOD of 10 mg BOD/liter. (Snyder-FIRL)
W76-11210

SMOKE TEST SEWERS TO FERRET OUT ILLEGAL INFLOW,
For primary bibliographic entry see Field 8G.
W76-11211

INDUSTRIAL WASTES MEET DOMESTIC SEWAGE.
American City and County, Vol. 91, No. 6, p 71-72, June, 1976. 2 fig, 1 tab.

Descriptors: *Waste water treatment, *Industrial wastes, *Municipal wastes, *Aeration, Biological treatment, Oxidation lagoons, Biochemical oxygen demand, Odor, Foaming, Chlorination.

The construction of a combined secondary treatment plant to handle municipal primary wastes from the city of Grand Rapids, Michigan and industrial wastes from a paper mill is described. The treatment plant is an extended aeration type. Following primary treatment, overflow from the domestic and industrial primary clarifiers is combined and pumped to the secondary plant through a 36-inch force main. Two 'A' lagoons receive the primary effluent and waste activated sludge. These 'A' lagoons operate in a complete-mix mode with a 29-hour detention time and are designed to remove from 55-90% of the influent biochemical oxygen demand. Effluent from the 'A' lagoon goes to two clarifiers where sludge is settled out for return to the lagoons or for pumping to the primary plant for dewatering. Clarifier effluent flows to two 'B' lagoons for further aeration with a 30-hour detention time to complete the biochemical oxygen demand removal. The liquor then flows to two 'C' lagoons for chlorination and final settling prior to discharge to the river. The city owns the facility, and the paper mill pays for service based on a metered flow pro-rated share. Problems being experienced with the facility include odor and foam control which are expected to be solved with additives and minor repairs. (Kreager-FIRL)
W76-11212

OZONE PROVIDES ALTERNATIVE FOR SECONDARY EFFLUENT DISINFECTION PART 3,
Welsbach Ozone Systems Corp., Philadelphia, Pa.
C. Nebel, R. D. Gottschling, P. C. Unangst, H. J. O'Neill, and G. V. Zintel.
Water and Sewage Works, Vol. 123, No. 6, p 81-83, June, 1976. 4 fig, 41 ref.

Descriptors: *Waste water treatment, *Sewage treatment, *Ozone, *Sewage effluents, *Disinfection, Chlorine, Hydrogen ion concentration, Oxidation, Detergents, Organic compounds, Tertiary treatment.

The conclusion of a three-part article on ozone in secondary effluent disinfection deals with ozone as a serious alternative to chlorine. At the Blue Plains Treatment plant in Washington, D. C., it has been demonstrated that ozonolysis always shifts the pH toward neutrality. Ozone has also been shown to oxidize all naturally occurring cyanides in a secondary effluent and to eliminate ABS and LAS detergents. Ozone also reduces or eliminates organic pesticides from sewage effluent. It was concluded that ozonization of secondary effluent is an effective disinfection method, with tertiary treatment obtainable at no extra cost. Additionally, an ozone-induced frothing process is capable of removing significant amounts of dissolved and suspended matter via oxidation and physical separation by flotation. (See also W76-09445 and W76-09715) (Kramer-FIRL)
W76-11213

ACID TREATED CATIONIC STARCH IN THE FLOCCULATION AND DEWATERING OF SLUDGE,
W. G. Hunt, and R. J. Belz.
United States Patent 3,962,079. Issued June 8, 1976. Official Gazette of the United States Patent Office, Vol. 947, No. 2, p 754, June, 1976

Descriptors: *Patents, *Sludge treatment, *Flocculation, *Dewatering, Municipal wastes, Cations, Waste treatment.
Identifiers: Starches

A patent for a process to flocculate and dewater municipal raw primary sludge is presented. The process involves adding between 0.007-0.200% (based in dry weight of the sludge) of an acid treated gelatinized cationic starch ether of amine butene halide to the sludge. The degree of amine butene halide substitution in the reagent is between 0.15 and 0.25, and the reagent fluidity ranges between 30-50 ml. The sludge is then dewatered to approximately below 70% moisture. (Kreager-FIRL)
W76-11214

PROCESS FOR CONVERTING AQUEOUS SEWAGE TO POTABLE WATER,
Texaco Inc., New York. (Assignee).
H. V. Hess, W. F. Franz, and E. L. Cole.
United States Patent 3,962,076. Issued June 8, 1976. Official Gazette of the United States Patent Office, Vol. 947, No. 2, p 752-753, June, 1976. 1 fig.

Descriptors: *Sewage treatment, *Water reuse, *Potable water, *Water purification, *Patents, Organic compounds, Mineral water, Brines, Sludge, Byproducts, Separation techniques, *Waste water treatment.

A patent for a process to convert aqueous sewage containing dissolved brine-forming minerals and organic compounds to potable water and coke is described. The process involves the following steps: separating the sewage into a primary sludge and a relatively cool primary effluent containing the dissolved minerals; passing the effluent into direct counter-current contact with relatively hot hydrocarbon liquid under a pressure of 1000-3000 lbs/sq. in. and at a temperature of between 600 and 700 F, thereby forming a hydrocarbon minerals-free water solution, a cooled hydrocarbon, and a hot concentrated minerals-containing brine solution; separting the hydrocarbon from the water; flashing at least a part of the water; condensing the water for potable use; pressurizing the sludge to around 1000-3000 lbs/sq in.; and injecting the hot brine into the sludge in order to coke the sludge in the liquid phase and form a reject coker effluent, gases, and coke. (Kreager-FIRL)
W76-11215

SYSTEM FOR TREATING SLUDGE,
Inoue-Japan Research, Inc., Yokohama (Japan). (Assignee).
K. Inoue, and A. Shimizu.
United States Patent 3,962,069. Issued June 8, 1976. Official Gazette of the United States Patent Office, Vol. 947, No. 2, p 750, June, 1976. 1 fig.

Descriptors: *Patents, *Sludge treatment, *Electrochemistry, *Dewatering, Waste treatment, Equipment, Electrodes.

A patent for a device which treats sludge is described. The apparatus consists of the following components: a vessel for receiving a bath of the sludge, an electrically conductive member with a screen-like perforated surface that is continuously displaceable through and outside of the bath along a predetermined path to form a first electrode, a second electrode juxtaposed with the first electrode in the bath, a power supply for applying an electric potential across the two electrodes to electrochemically effect a flow of water from the sludge through the electrode perforations on which the sludge deposits, a means for removing the sludge deposits from the perforated surface, a means for detecting the water content of the sludge deposit, and a means for controlling the electrical potential of the apparatus so that a desired water content of the sludge deposit can be maintained (Kreager-FIRL)
W76-11216

PROCESS FOR TREATING WASTE WATER,
Air Products and Chemicals, Inc., Allentown, Pa. (Assignee).
K. Wyatt
United States Patent 3,960,717. Issued June 1, 1976. Official Gazette of the United States Patent Office, Vol. 947, No. 1, p 305, June, 1976. 1 fig

Descriptors: *Patents, *Waste water treatment, *Activated sludge, *Aeration, *Organic compounds, *Nitrogen, Gases, Oxygen, Biological treatment, Separation techniques, Recycling

A patent for an activated sludge process designed to treat waste water containing organic matter and dissolved nitrogen gas is described. The waste water is first pretreated in an enclosed zone by contact with an oxygen enriched stripping gas having an oxygen content in excess of that of air and a nitrogen partial pressure less than that of air. At least 25% (by weight) of the dissolved nitrogen gas is stripped from the waste water and vented from the pretreatment chamber. The pretreated waste water is then introduced along with recirculated activated sludge into an enclosed aeration zone where an oxygen enriched aeration gas is also introduced. Biological degradation of the organic matter in the waste water occurs in this enclosed mixed liquor aeration zone. The mixed liquor is then discharged from the aeration zone, with the activated sludge being separated from the liquor and recirculated back to the aeration zone. The oxygen enriched stripping gas used in the pretreatment stage consists of at least some oxygen enriched aeration gas withdrawn from the mixed liquor aeration zone of the apparatus. (Kreager-FIRL)
W76-11217

METHOD OF PROCESSING REFUSE AND/OR SLUDGE AND A PLANT FOR CARRYING OUT THE METHOD,
J. R. Kaelin.
United States Patent 3,960,537. Issued June 1, 1976. Official Gazette of the United States Patent Office, Vol. 947, No. 1, p 255-256, June, 1976. 1 fig.

Descriptors: *Patents, *sludge treatment, *Solid wastes, *Waste treatment, *Byproducts, *Biological treatment, Equipment, Design criteria, Fertilizers, Organic compounds, Treatment facilities.
Identifiers: Compost.

A patent for a biological conversion process and apparatus designed to form compost from refuse or thickened sludge is described. The material to be treated is placed into the top of a continuous treatment chamber where it is permeated with a gas mixture delivered under elevated pressure by several gas distributor blades in the chamber. The distributor blades are rotated about an axis which is parallel to the direction in which the material to be treated passes. The gas mixture is exhausted by means of suction outlets which are associated with each gas distributor blade and are located in the side wall of the treatment chamber. The treated material is discharged at the bottom of the treatment chamber. (Kreager-FIRL)
W76-11218

EWER WASTE WATER TREATING AGENT RODUCED FROM WASTE CRACKING ATALYST,
talysts and Chemicals Industries Co., Ltd, kyo (Japan). (Assignee).
Sanga, and Y. Nishimura.
ited States Patent 3,960,760. Issued June 1, 76. Official Gazette of the United States Patent fice, Vol. 947, No. 1, p 317-318, June, 1976.

scriptors: *Patents, *Waste water treatment, mmonium salts, *Heavy metals, *Byproducts, talysts, Ions, Chemical wastes, Industrial stes.

patent for a process that produces a powder use- for removing ammonium ions and heavy metal s from waste water is described. Waste silica- mina catalyst particles are utilized as the start- material. The method involves soaking catalyst ticles previously used in a fluid-bed catalytic cking unit in an aqueous sodium hydroxide ution (0.2-0.5 normal concentration) at a tem- ature between 70 and 105C for from 2-48 hours. ywhere between 50-100 milliliters of sodium roxide solution is used per 10 grams of waste alyst particles treated. The catalyst particles are removed from the sodium hydroxide solution are washed and dried to obtain a powder use- for treating waste water. (Kreager-FIRL)
5-11219

THOD AND APPARATUS FOR TREATING UID SEWAGE AND WASTE,
R. Lebo.
ted States Patent 3,960,718. Issued June 1, 5. Official Gazette of the United States Patent ce, Vol. 947, No. 1, p 306, June, 1976. 1 fig.

criptors: *Patents, *Waste water treatment, ration, *Organic wastes, *Byproducts, ients, Fertilizers, Sewage treatment, Ox- ation.

atent for a process designed to treat liquid e containing sewage and/or manure such that iquid can be used as a plant nutrient and soil itioner is described. The liquid waste is fed a cone-shaped pressure vessel into which a m of pressurized oxygen-containing gas is in- d. The oxygen injection is designed to impart trifugal motion to the liquid waste and imp- against the solids in the liquid with sufficient to break the solids into small particles. The en-containing gas also thoroughly aerates the material and pressurizes the vessel such that pressure above the liquid in the vessel is een 4 and 15 pounds/sq in. Sulfuric acid is injected into the liquid material so that the rial's pH can be adjusted to 3.0 or less for the se of sterilization; the pH is then readjusted ween 6-7. The gas pressure above the liquid in the vessel is then allowed to cause the rge of the liquid material from the vessel a compost material such as sawdust, ground peat-moss, straw, or wood chips. (Kreager-
)
1220

POSITIONS FOR TREATING DOMESTIC INDUSTRIAL LIQUID WASTES,
lan Co., Inc., Biddeford, Ma. (Assignee).
Chappell.
l States Patent 3,963,637. Issued June 15, Official Gazette of the United States Patent , Vol. 947, No. 3, p 1270, June, 1976. 1 fig.

ptors: *Patents, *Flocculation, *Waste treatment, *Industrial wastes, *Domestic , Municipal wastes, Organic compounds, nic compounds, Liquid wastes.

nt for an acid formula composition used in ating industrial, domestic, and municipal wastes is described. The composition con- f the following components: 30-98% (by weight) of aluminum sulfate; 2-20% (by weight) of an alkali metal chloride; 0.0005-0.1% (by weight) of sodium or potassium hypochlorite; 10-25% (by weight) of an inorganic acid consisting of phosphoric, hydrochloric, sulfuric, or nitric acid; and 1-25% (by weight) of an organic acid consisting of oxalic, formic, acetic, or lactic acid. (Kreager-FIRL)
W76-11221

INTEGRAL CIRCULAR WASTEWATER TREATMENT PROCESS,
Union Carbide Corp., New York. (Assignee).
L. M. La Clair, J. R. McWhirter, and W. L. Ross.
United States Patent 3,963,609. Issued June 15, 1976. Official Gazette of the United States Patent Office, Vol. 947, No. 3, p 1261, June 1976. 1 fig.

Descriptors: *Patents, *Waste water treatment, *Biochemical oxygen demand, *Aeration, *Activated sludge, Biological treatment, Design criteria, Oxidation, Recycling, Oxygen, Separation techniques.

A patent for a process to reduce the biochemical oxygen demand of waste water is described. The process involves aeration with at least 50% oxygen in the presence of recycled activated sludge to achieve biological oxidation and biochemical oxygen demand reduction. The oxygen feed gas, waste water, and activated sludge are mixed in a first aeration zone wherein a fluid is simultaneously recirculated; and the partially oxygenated liquor as well as the gas which is partially depleted of oxygen are then separately introduced into a second aeration zone for continuous mixing and fluid recirculation. The further oxygenated liquor from the final aeration zone which has a reduced biochemical oxygen demand is separated into effluent water and activated sludge in a clarification zone, with at least part of the sludge being returned to the first aeration zone for recycling. (Kreager-FIRL)
W76-11222

PROCESS FOR THE PURIFICATION OF WASTE WATERS,
Tecneco S.p.A., Fano (Italy). (Assignee).
G. Pascarella, and F. Salvemini.
United States Patent 3,962,077. Issued June 8, 1976. Official Gazette of the United States Patent Office, Vol 947, No. 2, p 753, June, 1976. 1 fig.

Descriptors: *Waste water treatment, *Patents, *Industrial wastes, *Resins, *Reverse osmosis, *Electrolysis, Chemical precipitation, Neutralization, Evaporation, Organic compounds, Inorganic compounds, Recycling, Cations, Anions.

A patent for a process to treat wastes containing resins used for processing sugar juices is described. The process involves the following steps: feeding waste water from the regeneration of decoloring resins to a reverse osmosis section; feeding waste waters from the regeneration of anionic and cationic demineralizing resins to anodic and cathodic compartments, respectively, of electrolytic cells for electrolysis; mixing and neutralizing the treated cationic and anionic streams, subjecting the waters to a reverse osmosis treatment, and mixing them with treated solution from the first step; feeding the treated water from the last step to an evaporator for recovery of dry organic compounds; and feeding water from the regeneration of decalcifying resins to a precipitation section containing sodium hydroxide and carbon dioxide and subsequently neutralizing the water prior to a final reverse osmosis treatment. The waste water treated contains both inorganic and organic compounds which may or may not be ionizable. (Kreager-FIRL)
W76-11223

PROCEEDINGS OF THE SOUTHEASTERN CONFERENCE ON WATER SUPPLY AND WASTEWATER IN COASTAL AREAS,
North Carolina Water Resources Research Inst., Raleigh.
Held at Wrightsville Beach, N. C., April 2-4, 1975, 187 p. Edited by James M. Stewart. $10.00.

Descriptors: *Southeast U. S., *Waste disposal, *Water supply, Waste water disposal, Waste disposal wells, Groundwater resources, Waste water treatment, *Alternative planning, Land management, *Coastal plains, Marine biology, Financing, Financial feasibility, Water reuse, Institutions, Estuarine environment, Reviews, Ecology.
Identifiers: *Ocean outfalls, Coastal areas, Land application, Public participation, Marine environment, Treatment alternatives.

Among the most valuable resources of the Southeastern United States are its coastal lands and waters. The coastal areas, and in particular their estuaries, are among the most biologically productive regions of the nation, spawning major sports and commercial fisheries. The extremely high recreational and esthetic values of coastal lands and waters carry the seeds of their own destruction through their attractiveness for economic development. This Conference with 17 major presentations was conducted to review the State of the Art of proper planning and management of water supply and wastewater disposal is coastal areas. Special attention was paid to defining technological and institutional alternatives, their relation to land use planning and environmental protection, and to identifying those water and wastewater problems of significance in coastal areas. The Conference was sponsored by the Coastal Plains Center for Marine Development Services, Coastal Plains Regional Commission, Water Resources Research Institute of The University of North Carolina, and the University of North Carolina Sea Grant Program. (See W76-11225 thru W76-11230) (Stewart-North Carolina State)
W76-11224

WATER SUPPLY AND WASTEWATER DISPOSAL - PLANNING AND PROBLEMS - IN COASTAL AREAS,
Oesen (Henry von) and Associates, Inc., Wilmington, N. C.
P. S. Denison.
In: Proceedings of the Southeastern Conference on Water Supply and Wastewater in Coastal Areas, April 2-4, 1975, Wilmington, North Carolina, University of North Carolina, p 7-11.

Descriptors: *Water supply, *Waste water treatment, *Domestic wastes, *Sewerage, *Waste water disposal, *Coasts, *Outlets, Atlantic Ocean, Atlantic coastal plain, *North Carolina, Planning, Programs, Oceans, Treatment, Sewage treatment, Estuarine environment, Estuaries.
Identifiers: Regional planning.

A review of water supply and waste water disposal problems in coastal areas of the United States is presented, with particular emphasis on the North Carolina area. Limited local groundwater supplies in beach communities of North Carolina are diminishing such that plans are underway to augment these supplies with additional potable water transported from more productive mainland areas. Discharges of domestic sewerage wastes into the coastal soils are beginning to adversely affect fragile estuarine waters; the most viable solution to the problem appears to be the collection and treatment of such wastes, followed by disposal of the effluent residual into the Atlantic Ocean via outfalls. Local and regional water supply and waste water treatment planning programs throughout North Carolina are outlined. (See also W76-11224) (Kreager-FIRL)
W76-11225

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OCEAN OUTFALL DISPOSAL SYSTEMS,
Engineering-Science, Inc., Berkeley, Calif.
D. L. Feuerstein.
In: Proceedings of the Southeastern Conference on Water Supply and Wastewater in Coastal Areas, April 2-4, 1975, Wilmington, North Carolina, University of North Carolina, p 12-26, 2 fig, 1 tab.

Descriptors: *Waste water disposal, *Waste water treatment, *Coasts, *Waste dilution, *Atlantic Ocean, *Outlets, *Mathematical models, *Dispersion, *Diffusion, Design criteria, Disposal, Treatment, Feasibility, Cost-benefit analysis, Evaluation.
Identifiers: *Ocean outfalls.

A theoretical examination of mechanisms affecting the diminution of waste water constituents discharged from ocean outfalls is presented along with an evaluation of the efficacy of submarine outfall disposal systems for East Coast conditions. Mathematical expressions are derived for predicting the initial dilution occurring in the immediate vicinity of a diffuser, subsequent dilution resulting from lateral dispersion, and diminution caused by the disappearance or decay of non-conservative waste water constituents. Proper diffuser design is shown to be capable of effecting dilutions on the order of 50 to 100 in the initial mixing zone. The use of waste water treatment facilities in conjunction with outfall discharge is also considered, and it is shown that increasing treatment levels can be matched with decreasing dilution capacities of disposal facilities to satisfy the same receiving water quality objectives. Submarine outfall disposal systems on the East Coast appear to be cost-effective and are recommended for evaluation. (See also W76-11224) (Kreager-FIRL)
W76-11226

LAND DISPOSAL OF WASTEWATER,
North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering.
For primary bibliographic entry see Field 5E.
W76-11227

SHALLOW SUBSURFACE DISPOSAL OF WASTEWATER,
North Carolina Dept. of Natural and Economic Resources. Div. of Environmental Management.
For primary bibliographic entry see Field 5E.
W76-11228

THE ROLE OF CONVENTIONAL WASTEWATER TREATMENT IN COASTAL AREAS,
North Carolina Univ. at Chapel Hill. Wastewater Research Center.
J. C. Brown.
In: Proceedings of the Southeastern Conference on Water Supply and Wastewater in Coastal Areas, April 2-4, 1975, Wilmington, North Carolina, University of North Carolina, p 75-86. 1 tab, 8 ref.

Descriptors: *Waste water treatment, *Waste water disposal, *Coasts, *Treatment facilities, Oceans, Outlets, Nitrogen, Phosphorus, Evaluation, Water quality control, Water spreading, Pretreatment(Water).

An evaluation of the role of conventional waste water treatment in coastal area water quality management is presented. Secondary treatment appears to be sufficient for maintaining current water quality standards, and additional processes can be added to conventional treatment plants for the removal of nitrogen or phosphorus as nutrient discharge limitations are developed in the future. When removal of nutrients is not technically or economically feasible at a treatment plant, conventional secondary treatment can serve as a pretreatment for ultimate disposal by land-spreading methods. Ocean outfalls offer the most environmentally and ecologically attractive solution for permanent and resort communities located close to the ocean, with conventional treatment methods serving as pre-treatment for ultimate disposal in the ocean. (See also W76-11224) (Kreager-FIRL)
W76-11229

SUMMARY: TECHNOLOGICAL ALTERNATIVES FOR WATER SUPPLY AND WASTEWATER DISPOSAL IN THE COASTAL AREA,
Clemson Univ. S. C. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5E.
W76-11230

LAND APPLICATION OF WASTEWATER.
Environmental Protection Agency, Philadelphia, Pa. Region III.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-241 438, $4.75 in paper copy, $3.00 in microfiche. Proceedings of a research symposium held at the University of Delaware, Newark, Delaware on November 20-21, 1974. Published May 1, 1975 as Report EPA 903/9-75-017.

Descriptors: *Waste water treatment, *Waste water disposal, Percolation, Land use, Land reclamation, *Water reuse, Irrigation, Recycling, Infiltration, *Overland flow, *Agricultural runoff, Agricultural watersheds, *Farm wastes.
Identifiers: *Land application.

Table of contents include: EPA Guidance and Policy on Land Treatment; Land application research at Robert S. Kerr environmental research laboratory; Land application practices and design criteria; Public health aspects of land application of wastewater effluents; Educational and informational needs for achieving public acceptance; Experiences at Penn State with land application; The environmental and sociological impact of recycling of agricultural waste by land use; Experience with land application of wastewater and state regulations and the pennypack watershed; Experience with land application of wastewater and state regulations- pennypack watershed, Pennsylvania; Land disposal of wastewater in the commonwealth of Pennsylvania-A regulatory view; Overland flow treatment of wastewater- a feasible approach; Infiltration-percolation systems; and land application of treated sewage in the mountain state. (See also W76-11232 thru W76-11237)
W76-11231

LAND APPLICATION RESEARCH AT ROBERT S. KERR ENVIRONMENTAL RESEARCH LABORATORY,
Robert S. Kerr Environmental Research Laboratory. Ada, Okla.
R. E. Thomas, and C. C. Harlin, Jr.
In: Land Application of Wastewater, November 20-21, 1974, Newark, Delaware, p 3-12. 22 ref.

Descriptors: *Waste water treatment, *Waste water disposal, *Percolation, *Infiltration, *Irrigation, *Overland flow, Research priorities, Programs, Groundwater, Lakes, Municipal wastes, Denitrification, Biodegradation, Organic compounds, Sewage treatment, Phosphorus.
Identifiers: Land application.

Research being conducted by the Robert S. Kerr Environmental Research Laboratory for the Environmental Protection Agency to evaluate various methods of waste water management which incorporate land application are outlined. Crop irrigation is being investigated in terms of locating and evaluating currently available quantitative information on application rates, crop responses, soil changes, and groundwater quality changes. Projects designed to demonstrate crop irrigation approaches in geographic areas where historical information is scarce are also being conducted. Infiltration-percolation investigations include four studies in water-short southwestern states and two studies in water-rich north central states. Th studies involve assessing the effectiveness of infiltration approach for direct recharge of a p ble groundwater supply with secondary effl evaluating the use of infiltration-percolation rendering municipal effluent suitable for f and maintaining the water level of recreati lakes, and evaluating existing infiltration-perc tion facilities. Projects designed to assess feasibility of treating raw sewage by overland are also being conducted in addition to research on phosphorus retention in denitrification, biodegradation of organics, climatology. (See also W76-11231) (Kre FIRL)
W76-11232

LAND APPLICATION PRACTICES DESIGN CRITERIA,
Metcalf and Eddy, Inc., Palo Alto, Calif.
C. E. Pound, and R. W. Crites.
In: Land Application of Wastewater, Nove 20-21, 1974, Newark, Delaware, p 13-26. 4 tab, 19 ref.

Descriptors: *Irrigation, *Infiltra *Percolation, *Overland flow, *Waste water ment, Waste water disposal, Design cri Costs, Soil properties, Water quality, Sites formance, Evaluation.
Identifiers: *Land application.

Engineering criteria for the design of waste treatment and disposal systems involving la plication are outlined. Irrigation, infiltratio colation, and overland flow techniques reviewed in terms of site characteristics, cl factors, waste water loss, crop productio pected treatment performance, liquid lo rates, soil type, and applicable water q criteria. A preliminary analysis of an actua study is included to illustrate how these dif land application methods can be combined to come restrictions in topography, soil permea water quality criteria, and construction Emphasis is placed on considering land trea methods as unit processes and selecting trea methods so as to provide a design that is tailo the specific site. (See also W76-11231) (Kr FIRL)
W76-11233

EXPERIENCES AT PENN STATE WITH APPLICATION,
Pennsylvania State Univ., University Park. of Forest Resources.
W. E. Sopper.
In: Land Application of Wastewater, Nov 20-21, 1974, Newark, Delaware, p 39-51. 14 ref.

Descriptors: *Sewage disposal, *Rec *Irrigation, Municipal wastes, Waste wate ment, Waste water disposal, Land reclam Evaluation, Water management, Water s Forests.
Identifiers: Spray irrigation, *Land applicat

The results of experiments involving the sp rigation of cropland and forested area treated municipal sewage effluent are pre Combinations of agronomic and forested ar pear to provide the greatest flexibility fo recycling operations. Such systems are adaptable to small cities and suburbs than metropolitan areas because of the availab open land close to the waste water treatme in the former case. However, the lan requirement is not a major prohibitive fac the recommended level of irrigation (5 cm only 52 hectares of land is required for the of 4 million liters of waste water/day. metropolitan areas may be able to utilize go ses, playing fields, forest preserves and greenbelts, scenic parkways, and perhaps vided highway and beltway medial strips fo

ter disposal. The experimental results also in-
ate that municipal waste water might be used to
laim and revegetate many of the barren bitu-
ious strip mined spoil banks and anthracite
ise banks existing throughout the Appalachian
ion and restore them to a more esthetic and
ductive state. (See also W76-11231) (Kreager-
L)
6-11234

ERLAND FLOW TREATMENT OF WASTE-
TER - A FEASIBLE APPROACH,
ıy Engineer Waterways Experiment Station,
ksburg, Miss. Environmental Effects Lab.
. Hunt, and C. R. Lee.
Land Application of Wastewater, November
1, 1974, Newark, Delaware, p 71-83. 13 fig, 17

criptors: *Overland flow, *Waste water treat-
t, *Waste water disposal, *Recycling, Moni-
g, Flow, Water quality, Costs, Microorgan-
, Soils, Surfaces.
tifiers: *Land application.

use of overland flow for the treatment and
osal of waste water is discussed in terms of its
retical basis and system operation. In an over-
flow system, the waste water is applied at the
f gentle sloping hills and is allowed to flow
the soil surface down to collection channels.
treatment is represented by an intimate in-
tion among the soil surface layer, surface or-
mat, plants, and microorganisms. The com-
length of the slope is 100-300 ft, and normally
ystem is employed on slopes ranging from 2-
Application rates are low, generally less than
cre-in/day; waste water, however, is applied
days/week so that the weekly application rate
out 2.5 acre-in. The ability to monitor waste
as it leaves the treatment site is an especially
ble characteristic of overland flow systems.
of the treated waste water is available at cen-
ollection channels for quality determinations
or discharge or other uses. The cost of over-
low systems is about $2000/acre. (See also
11231) (Kreager-FIRL)
11235

TRATION-PERCOLATION SYSTEMS,
ultural Research Service, Phoenix, Ariz.
Conservation Lab.
uwer.
nd Application of Wastewater, November
1974, Newark, Delaware, p 85-92. 4 fig, 11

ptors: *Infiltration, *Percolation, *Waste
treatment, *Waste water disposal,
cling, Rates of application, Infiltration
Hydraulics, Nitrogen, Phosphorus,
es, Phosphates, Dentrification.
iers: Land application.

e of infiltration-percolation systems for the
ent and disposal of waste water is
ed. The waste water in infiltration-percola-
stems is applied at much higher rates (0.3-
week) than with low-rate or irrigation-type
s, resulting in the obvious advantage of low
equirements (1-10% of that for low-rate
s). High-rate systems require relatively
ble soil such as sandy loams to medium
The transmissibility of the underlying
should also be sufficiently high to conduct
er laterally away from the infiltration area
undue water table rises. Another ad-
of high-rate systems is that the infiltration
e much higher than the evapotranspiration
cause of the high hydraulic loading rates in
e systems, the amounts of nitrogen,
orus, and other elements entering the
with the waste water are much higher than
an remove. Thus, special management
ues are required to stimulate dentrification
te and immobilization of phosphate in the
soil to yield renovated water of acceptable quality. It may be desirable to restrict the spread of the renovated water into the groundwater basin by selecting the infiltration site so that the renovated water drains into surface water. (See also W76-11231) (Kreager-FIRL)
W76-11236

LAND APPLICATION OF TREATED SEWAGE IN THE MOUNTAIN STATE,
Campaign Clean Water, Charleston, W.Va.
E. Light.
In: Land Application of Wastewater, November 20-21, 1974, Newark, Delaware, p 93-94. 7 ref.

Descriptors: *Sewage treatment, *Sewage disposal, *Municipal wastes, *Overland flow, *Irrigation, *West Virginia, Soils, Topography, Climates, Land reclamation, Mountains, Application rates, Feasibility, *Waste water treatment.
Identifiers: *Land application.

The feasibility of using land application techniques (overland flow, spray irrigation) for the treatment of municipal sewage wastes in the state of West Virginia is discussed. Objections to land treatment in the state because of the topography, climate, and soil of the Appalacian Mountains are cited as being invalid based on the success of land application techniques in other areas of the country with similar problems. About one-third of the soil scattered throughout the Appalachians is estimated to be suitable for land treatment. Erosion is not expected to be a problem in West Virginia if application rates are not too high since the state is heavily forested. The state's strip mines and coal refuse piles are considered prime land treatment sites. Since 70 cities in West Virginia will be required to go to advanced treatment, land application of municipal wastes is proposed as a feasible alternative that is economically realistic. (See also W76-11231) (Kreager-FIRL)
W76-11237

PROCEEDINGS OF THE ANNUAL CONFERENCE, ONTARIO SECTION, AMERICAN WATER WORKS ASSOCIATION; POLLUTION CONTROL ASSOCIATION OF ONTARIO; AND ONTARIO MUNICIPAL WATER ASSOCIATION.
For primary bibliographic entry see Field 5F.
W76-11249

A NEW CONCEPT IN SMALL WATER SYSTEMS,
MacLaren (James F.) Ltd., Toronto (Ontario).
G. A. Aldworth.
In: Annual Conference Proceedings of the Ontario Section of the American Water Works Association, Pollution Control Association of Ontario, and Ontario Municipal Water Association, April 20-23, 1975, Toronto, Ontario, p 228-248. 12 fig, 1 tab.

Descriptors: *Water supply, *Sewage treatment, *Design criteria, Topography, Climates, *Freezing, *Waste water treatment, Treatment facilities, Equipment, Materials, Insulation, Costs, *Water treatment, Temperature.

Design criteria associated with the development of special water supply and sewage treatment systems subject to geographical and climatic constraints are outlined. Three particular projects are described: the development of an air-transportable above-ground water and sewage treatment system suitable for ambient temperatures between -25 and +125 F, the upgrading of existing water supply systems in Northern Newfoundland and Southern Labrador to render them less susceptible to freeze-up, and the development of a full-scale shallow-buried water and sewage system in very rocky terrain. Detailed information on special equipment used (plastic piping, water heaters, pipe insulation, pipe frost covers, bleeders, mobile fire pumps) and the costs involved is provided along with diagrams of each installation. (See also W76-11249) (Kreager-FIRL)
W76-11253

THE TREATMENT OF WATER PURIFICATION PLANT WASTES,
Gore and Storrie Ltd., Toronto (Ontario).
For primary bibliographic entry see Field 5F.
W76-11256

PROCEEDINGS OF THE THIRD NATIONAL CONFERENCE ON COMPLETE WATERUSE: SYMBIOSIS AS A MEANS OF ABATEMENT FOR MULTI-MEDIA POLLUTION,
(1976), 628 p. Held at Cincinnati, Ohio, June 27-30, 1976. Sponsors: American Institute of Chemical Engineers and Environmental Protection Agency Technology Transfer. Edited by L. C. Cecil and P. C. Welsh. EPA R804195010.

Descriptors: *Water reuse, *Symbiosis, Ecology, *Waste water treatment, *Pollution abatement, *Separation techniques, Industrial wastes, Municipal wastes, Planning, Management.

The Conference includes papers under the following major categories: Symbiosis; Planning; The Marketplace Sink; Wastewater Reuse; Separation Methods - Adsorption; Separation Methods - Ion Exchange; Separation Methods - Magnetic; Separation Methods - Membranes; Urban Streams; Power; Energy Recovery; Cooling Towers; Coal; Health; Food Processing; Municipal; and Sludge Utilization. (See also W76-11258 thru W76-11274)
W76-11257

SYMBIOSIS MAKES COMPLETE WATER REUSE PRACTICAL,
L. K. Cecil.
In: 3rd National Conference on Complete WateReuse, June 27-30, 1976, Cincinnati, Ohio, p 12-14.

Descriptors: *Water reuse, *Recycling, *Municipal wastes, *Farm wastes, *Industrial wastes, Byproducts, Planning, Pollutants, Sewage, Urban runoff, *Waste water treatment, *Symbiosis.
Identifiers: Municipal-industrial wastes.

The establishment of a symbiotic relationship between municipal, industrial, and agricultural activities in an area is proposed as a means to achieve complete water reuse. Sewage and surface runoff from a city can be utilized by industries which are properly situated adjacent the city for heat dissipation requirements. Garbage can be fractionated into burnable compounds for the production of heat energy, with the unburnable fractions being converted into marketable forms. Industries can also utilize agricultural wastes for beneficial purposes if farms are properly located around a city. Waste water from industry, in turn, can be utilized by agriculture if farms are located within a reasonable distance of industrial complexes. Thus, by proper collaboration of cities, industries, and farms, the goal of zero discharge of pollutants into the aqueous environment can be approached. (See also W76-11257) (Kreager-FIRL)
W76-11258

PUERTO RICO: ALONG THE ROUTE OF WATER REUSE,
Environmental Protection Agency, San Juan, Puerto Rico.
M. M. Irizarry.
In: 3rd National Conference on Complete WateReuse, June 27-30, 1976, Cincinnati, Ohio, p 46-52. 8 fig, 2 tab, 8 ref.

Descriptors: *Water reuse, *Recycling, *Puerto Rico, *Water supply, *Water manage-

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ment(Applied), Irrigation, Infiltration, Percolation, Saline water intrusion, Industrial water, Groundwater recharge, Research and development, Programs, Organizations.

Activities concerning the reuse of waste water in Puerto Rico are reviewed. The Ponce Regional Water Resources Management Study, which is a cooperative effort between the Puerto Rican government and the U. S. Army Corps of Engineers, is concentrating on waste water management, water supply management, flood control, conservation of fish and wildlife, and recreation, with emphasis being given to water supply. The study covers 14 municipalities over an area of 734 sq mi and is evaluating the following reuse alternatives: the use of secondary treated effluent from water treatment plants for irrigation, infiltration, and percolation; the use of waste water for industrial purposes; and the use of waste water to prevent salt water intrusion. The Corps of Engineers is also conducting an island-wide water supply study with the Puerto Rico Department of Natural Resources. The U. S. Geological Survey has initiated a research project in Fort Allen, Salinas, Puerto Rico dealing with the use of secondary effluent for groundwater recharge. (See also W76-11257) (Kreager-FIRL)
W76-11259

REMOVAL AND RECOVERY OF AMMONIA FROM ANAEROBIC DIGESTER SUPERNATANT,
CH2M/Hill, Redding, Calif.
R. W. Prettyman, and L. G. Kepple.
In: 3rd National Conference on Complete WateRuse, June 27-30, 1976, Cincinnati, Ohio, p 95-99. 7 fig, 2 tab, 3 ref.

Descriptors: *Waste water treatment, *Byproducts, *Anaerobic digestion, *Ammonia, Fertilizers, Water reuse, Recycling, Water reclamation, Effluents, Industrial water, Nitrogen, Phosphorus, Absorption, Aeration, Flocculation, Chemical precipitation, Organic acids, Sulfates.
Identifiers: Stripping.

An ammonia removal and recovery process for rendering anaerobic digester supernatant suitable for industrial reuse is described. The supernatant is first aerated to strip excess carbon dioxide so that lime requirements are kept minimal. Lime is then added to precipitate phosphorus, flocculate organic matter, and obtain a pH of 11 for stripping ammonia nitrogen. The ammonia removal and recovery process employs an ammonia stripping unit and an ammonia absorption unit and produces ammonia in the form of a common fertilizer such as ammonium sulfate which can be sold as byproduct. In the stripping unit, the high pH influent stream flows down over packing material, and the recirculating air stream passes upward and carries the ammonia gas-laden air to the absorption unit. The stripping unit effluent which is relatively low in ammonia nitrogen is discharged from the bottom of the unit. Ammonia-laden air contacts an acidic absorbent liquid in the absorber unit, with ammonia gas being dissolved in the absorbent liquid and converted to ammonium ions. If sulfuric acid is added, for example, an ammonium sulfate solution is formed. (See also W76-11257) (Kreager-FIRL)
W76-11260

UNION CARBIDE'S REUSE OF SEWAGE WATER,
Carbide Chemicals Co., Bombay, India.
R. N. Banerji.
In: 3rd National Conference on Complete Water Reuse, June 27-30, 1976, Cincinnati, Ohio, p 161-165. 1 fig, 4 tab.

Descriptors: *Sewage treatment, *Water reuse, *Water reclamation, *Symbiosis, *Industrial water, Biological treatment, Activated sludge, Aeration, Flocculation, Filtration, Water softening, Chlorination, Costs, Demineralization, Sewage, Waste water treatment

A system for processing municipal sewage water and reusing it for industrial operations at Union Carbide's Chemicals and Plastics plant at Bombay, India is described. The sewage treatment system involves: raw water pumping and conveying, detritus matter removal, biological treatment (activated sludge) with extended aeration, clarification, chemical dosing, flocculation, sand filtration, softening, post chlorination, and demineralization. In order to make the treated water fit for industrial use and comparable with water from the municipal mains, the filtered water is passed through a softening process where the hardness is reduced from 140 milligram/liter to about 40 milligram/liter. The cost of the sewage reclaimed water is $.43/1000 imperial gallons as compared with $.72/1000 imperial gallons of municipal water. (See also W76-11257) (Kreager-FIRL)
W76-11261

GRANULAR MEDIA FILTRATION: A POSITIVE COST EFFECTIVE METHOD TO PREPARE WASTEWATERS FOR REUSE BY REMOVAL OF SUSPENDED SOLIDS,
Ecodyne Corp., Union, N. J. Industrial Waste Treatment Div.
G. R. Mace.
In: 3rd National Conference on Complete WateReuse, June 27-30, 1976, Cincinnati, Ohio, p 185-190. 7 fig, 2 tab.

Descriptors: *Filtration, *Filters, *Granules, *Waste water treatment, *Suspended solids, Water reuse, Water reclamation, Recycling, Oil, Efficiencies, Performance, Equipment.
Identifiers: Backwashing.

The use of granular media filtration for removing suspended solids from waste waters which are intended for reuse has recently increased. Filters can effectively remove up to 200-250 ppm of suspended solids from waste waters and produce effluent clarities in the 1-15 ppm suspended solids range. Granular filters are also the only time-tested unit operation available for filtering volumes of waste water experienced in industrial waste treatment plants. Types of granular filter configurations available include: vertical gravity, deep media vertical gravity or pressure, horizontal ('hot dog'), concrete gravity, and upflow gravity or pressure types. A combination of air scouring, underdrain nozzles, and air metering tubes not only allows for the removal of suspended solids in the 200-250 ppm range but allows for the removal of up to 60 ppm of oil. Backwashing which is initiated by turbidity meters in addition to pressure differential and automatic timers is being employed to achieve the consistently low suspended solids levels required for recycling and discharge. (See also W76-11257) (Kreager-FIRL)
W76-11262

WASTEWATER RECYCLE - THE PROPER APPROACH TO EVALUATION OF DISPOSAL VERSUS REUSE,
Ecodyne Corp., Union, N. J. Industrial Waste Treatment Div.
G. R. Mace.
In: 3rd National Conference on Complete WateReuse, June 27-30, 1976, Cincinnati, Ohio, p 191-195. 2 fig, 6 tab.

Descriptors: *Water reuse, *Water reclamation, *Waste water disposal, *Waste water treatment, *Industrial water, *Cost comparisons, *Cost analysis, Sludge disposal, Dewatering, Byproducts, Waste treatment, Economics, Water supply, Evaluation, Analytical methods, *Recycling.

A procedure for evaluating the cost of industrial waste water disposal versus recycle is presented. The procedure can be broken down into four major steps: a detailed analysis of the effluent; the effect of recycle water on the quality of the product; an analysis of waste treatment operations available; and the total economic analysis. The disposal of sludge is an especially important consideration since it is the most expensive part of the treatment system. The cost of sophisticated equipment to recover waste products should be weighed against direct disposal via landfill. The total economic analysis can be broken down into three independent analyses that need to be constructed: economic selection of individual waste treatment unit operations, economic selection of dewatering and sludge disposal alternatives, and the final economic decision of recycle versus disposal. A hypothetical case study is presented to illustrate the procedure. (See also W76-11257) (Kreager-FIRL)
W76-11263

THE EFFECTIVENESS OF GRANULAR ACTIVATED CARBON IN TREATING MUNICIPAL AND INDUSTRIAL WASTEWATERS,
ICI United States, Inc., Wilmington, Del.
P. B. DeJohn.
In: 3rd National Conference on Complete WateReuse, June 27-30, 1976. Cincinnati, Ohio, p 204-211. 3 fig, 7 tab, 20 ref.

Descriptors: *Adsorption, *Activated carbon, *Waste water treatment, *Granules, Municipal wastes, Industrial wastes, Physical properties, Coals, Performance, Isotherms, Measurement.
Identifiers: Municipal-industrial waste treatment, *Combined treatment

The use of granular activated carbon adsorption for treating municipal and industrial waste water is discussed. Topics covered include: methods for evaluating activated carbon, adsorption data developed on municipal wastes, the comparative physical properties of lignite and bituminous coal carbons, adsorption data developed on various types of industrial wastes, the effect of thermal regeneration on the adsorption performance of carbon, and symbiotic processes involving the utilization of carbon fines in other waste water processes and the utilization of the heat content of exit gases from other plant processes to regenerate activated carbon. Virgin bituminous coal carbons perform better than virgin lignite carbons in waste streams containing predominantly small molecules and vice versa. If the waste stream contains mostly small molecules, he granular carbon system should be designed on the basis of the performance of regenerated carbon. Isotherms can be used to determine if carbon can reduce the impurity level to the desired quantity. (See also W76-11257) (Kreager-FIRL)
W76-11264

SALA-HGMS MAGNETIC FILTERS FOR THE TREATMENT OF COMBINED SEWER OVERFLOW,
Sala Magnetics, Inc., Cambridge, Mass.
D. Allen, B. Arvidson, J. Oberteuffer, and R. Sargent.
In: 3rd National Conference on Complete WateReuse, June 27-30, 1976, Cincinnati, Ohio, p 239-251. 8 fig, 12 tab, 19 ref.

Descriptors: *Filters, *Magnetic studies, *Waste water treatment, *Filtration, Sewage, Storm water, Flocculation, Chemical reactions, Performance, Suspended solids, Heavy metals, Bacteria, Biochemical oxygen demand, Chemical oxygen demand, Turbidity, Pilot plants, Separation techniques, *Combined sewers.
Identifiers: *Magnetic separation filters.

Bench test and preliminary pilot results are presented for the treatment of combined storm overflow and raw sewage with high gradient magnetic separation filters. Good performance was obtained with a flocculation train residence and filtration time of 3 minutes or less, a fraction of th

ne required fro flocculation and processing in nventional waste treatment systems. Although e flocs formed were very small in size compared th those necessary for conventional settling or tering, the flocs themselves were much less sceptible to physical disruption. There were also lications that the addition of a magnetic filter aid ch as magnetite can reduce chemical reaction ie to less than 90 seconds. Pilot plant tests on nbined sewage overflow revealed cycle to cycle riations in performance not exceeding 2%, in- ating the system's stability. The data also in- ated that the results obtained with seeded high dient magnetic filtration generally surpass se obtained with primary and secondary stages conventional treatment in a single treatment ge. Typical data are presented for suspended ids, biochmical oxygen demand, chemcial ox- n demand, turbidity, heavy metals, and bac- al counts. (See also W76-11257) (Kreager- RL)
6-11265

ICKENING OF SEWAGE SLUDGE WITH ATERNARY AMMONIUM COMPOUNDS D MAGNETIC FIELDS,
span Corp., Buffalo, N. Y.
K. Wang, M. H. Wang, R. C. Ziegler, and M. P. er.
3rd National Conference on Complete teReuse, June 27-30, 1976, Cincinnati, Ohio, 2-258. 2 fig, 3 tab, 17 ref.

criptors: *Sludge treatment, *Dewatering, mmonium compounds, *Magnetic studies, sinfection, Coliforms, Iron oxides, Floccula- , Evaluation, Performance, Waste treatment, lge, Bacteria, Sewage sludge.
tifiers: *Sludge thickening, Quaternary am- ium compounds.

process using quaternary ammonium com- nds and magnetic fields for the thickening of age sludge was evaluated. Sludge dewatering eriments were performed by adding finely di- d iron oxide particles which acted as both hting and polarization-inducing agents along quaternary ammonium compounds which d as both flocculating and disinfectant agents. agglomerates (or flocs) containing the sludge s, iron oxide, and quaternary ammonium pound were flocculated and then passed gh a magnetic field for further polarization. polarized iron ores associated with the sludge merate attracted each other to form very high ht-to-surface area floc particles; and the con- ed flocs, with or without treatment by secon- flocculation, then settled rapidly. The super- t and settled sludge were simultaneously dis- ted by the quaternary ammonium compound. se of the quaternary ammonium compound ted in better sludge thickening than that ob- d from a control experiment and also resulted rop in total coliform count in the supernatant more than 100,000,000/100 ml to about 00 ml. The application of the magnetic field d beneficial to the sludge thickening process the system contained iron oxide particles. lso W76-11257) (Kreager-FIRL)
11266

ERSE OSMOSIS PILOT PLANT STUDIES THE PURIFICATION AND REUSE OF EF- NT FROM A SANITARY WASTE TREAT- T PLANT,
vell International, Golden, Colo. Rocky Plant.
Plock, D. E. Hausburg, and D. R. Horrell.
rd National Conference on Complete Reuse, June 27-30, 1976, Cincinnati, Ohio, p 3. 4 fig, 5 tab.

iptors: *Reverse osmosis, *Waste water ent, *Water reuse, *Reclaimed water, Sani- ngineering, Treatment facilities, Equipment, nation, Dissolved solids, *Pilot plants, Per- nce.

Pilot plant studies on the use of reverse osmosis to treat sanitary waste treatment effluent for reuse at a nuclear weapons facility were conducted. After passing about 20 gallons/minute of treated sanitary effluent through a pre-treatment stage, a chemical treatment stage, and a final filter, a reverse osmosis unit using cellulose triacetate hollow fiber membranes was employed to produce about 17.5 gallons/minute of product water and 2.2 gallons/minute of brine for a water recovery of 89%. Cellulose triacetate membranes were selected over polyamide hollow fiber membranes because of the following advantages: lower operating pressures, high rejection rates, higher quality product water, higher water recovery, lower inorganic scaling, the absence of bacterial fouling, and less susceptibility to temperature change. The pilot plant studies indicate that a product water containing less than 100 mg/liter of total dissolved solids can be obtained and that the flow of brine to the process waste treatment evaporator will be no greater than 2% of the feed stream going to the reverse osmosis recycling plant. (See also W76-11257) (Kreager-FIRL)
W76-11267

RECLAMATION OF GAS TURBINE WASTE HEAT FOR SLUDGE DRYING,
Metropolitan Sewerage District of the County of Milwaukee, Wis.
L. A. Ernest, R. E. Birner, J. H. Schlintz, and R. M. Manthe.
In: 3rd National Conference on Complete WateReuse, June 27-30, 1976, Cincinnati, Ohio, p 361-369. 2 fig, 2 tab, 1 ref.

Descriptors: *Sludge treatment, *Drying, *Heat transfer, *Symbiosis, *Byproducts, Treatment facilities, Equipment, Powerplants, Efficiencies, Temperature, Activated sludge, *Waste water treatment.
Identifiers: Combined cycles, Waste heat reuse.

The recovery of gas turbine waste heat for sludge drying at an activated sludge waste water treatment plantis described. Waste heat from gas turbines in the power generation section of the waste water treatment plant is diverted to 10 dryer furnaces to provide a drying temperature of 1200 F. This combined cycle operation reduces dryer fuel requirements by 70% and overall actual fuel consumption by 20%. The system is inherently safe because the dryers are normally at a negative pressure condition and consequently impose no detrimental back pressure on the gas turbine or connecting duct work. In addition, pressure sensitive devices dump the exhaust gases in the event of excessive back pressure to protect the system. (See also W76-11257) (Kreager-FIRL)
W76-11268

WASTEWATER REUSE WITHIN AN ARMY FIELD HOSPITAL,
Army Medical Bioengineering Research and Development Lab., Fort Detrick, Md.
W. P. Lambert, and L. H. Reuter.
In: 3rd National Conference on Complete WateReuse, June 27-30, 1976, Cincinnati, Ohio, p 447-456. 4 tab, 41 ref.

Descriptors: *Water reuse, *Reclaimed water, *Waste water treatment, *Hospitals, Potable water, Treatment facilities, Equipment, Efficiencies, Water purification, Brackish water, Freshwater.

A waste water reuse scheme proposed for transportable army field hospitals is described. The waste water reclamation and recycling system is designed to help meet water supply needs, to reduce logistical requirements, and to maintain necessary tactical flexibility. The system has two principal operating modes and three primary functions. An integrated mode functions to treat nonsanitary waste streams for nonpotable reuse; operation requires 85% net influent water recovery at approximately 4200 gallons/day outflow. The purified water will be used for potable use eventually. The second mode of operation has two functions. Nonsanitary waste waters from the hospital are treated for discharge to the environment by one set of unit processes, while a water purification unit treats natural fresh or brackish waters for potable use. The second operation mode involves the production of at least 3900 gallons/day of treated waste water, with at least 94% of the influent being discharged. The water purification unit produces at least 3500 gallons/day of potable water with no more than 10% influent loss. (See also W76-11257) (Kreager-FIRL)
W76-11269

TREATMENT OF ARMY M U S T FIELD HOSPITAL WASTEWATER FOR WATER REUSE,
Abcor, Inc., Cambridge, Mass. Walden Research Div.
A. Z. Gollan, M. H. Kleper, K. J. McNulty, and R. L. Goldsmith.
In: 3rd National Conference on Complete WateReuse, June 27-30, 1976, Cincinnati, Ohio, p 462-475. 11 fig, 7 tab, 5 ref.

Descriptors: *Waste water treatment, *Desclination, *Water reuse, *Reclaimed water, *Hospitals, *Treatment facilities, Reverse osmosis, Filtration, Ozone, Chlorination, Organic compounds, Water purification, Carbon, Chemical oxygen demand, Solid wastes, Performance, Evaluation, Efficiencies, Equipment.
Identifiers: Ultrafiltration.

A 1/4-scale breadboard version of a waste water treatment system designed for transportable Army hospitals was tested. The system is designed for operation in water reuse, water desalting, and waste treatment/discharge modes. The test demonstrated that the selected sequence of unit processes (waste equalization, ultrafiltration, reverse osmosis, ozonation, and chlorination) was effective in treating a time-varying composite of individual hospital wastes. The ultrafiltration and reverse osmosis stages were highly effective in reducing the total solids and organics concentrations of the equalized waste. Overall removal efficiencies for the ultrafiltration/reverse osmosis section ranged from 88-92% for total solids, 91-93% for total organic carbon, and 92-97% for chemical oxygen demand. Rather poor removal efficiencies were obtained for the ozonation system tested. The poor performance of the ozonation system was a result of reactor design and operation, the low output of the ozone generator, the presence of a refractory organic residual in the reverse osmosis permeate, and the lack of an automatic feedback system to control ozone conversion. The average overall system water recovery for the water reuse mode was 87%. (See also W76-11257) (Kreager-FIRL)
W76-11270

THE REMOVAL OF METALS FROM WASTEWATERS BY CHEMICAL TREATMENT AND FILTRATION,
Dallas Water Reclamation Research Center, Tex.
A. C. Petrasek, Jr., and S. E. Esmond.
In: 3rd National Conference on Complete WateReuse, June 27-30, 1976, Cincinnati, Ohio, p 502-509. 6 fig, 14 tab.

Descriptors: *Waste water treatment, *Metals, *Coagulation, *Filtration, Sewage, Lime, Arsenic compounds, Cadmium, Chromium, Mercury, Lead, Efficiencies, Performance, Evaluation, Biological treatment.
Identifiers: *Chemical treatment, Recarbonation, Alum.

The use of various chemical treatment methods along with filtration for the removal of metals from waste waters was investigated. Waste water from a sewage treatment plant was given addi-

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tional biological treatment in a completely mixed activated sludge system was chemically coagulated and filtered, and passed through an activated carbon contactor. For the chemical treatment stage three different approaches were investigated: high pH lime coagulation, alum coagulation, and high pH lime coagulation and recarbonation. High pH lime coagulation and recarbonation was generally more effective in removing metals than was alum coagulation. This was especially true for toxic metals such as arsenic, cadmium, chromium, mercury, and lead. Detailed removal percentage and changes in mean metals concentrations are reported for 25 metals. (See also W76-11257) (Kreager-FIRL)
W76-11271

WATER REUSE RESEARCH.
Dallas Water Reclamation Research Center, Tex.
A. C. Petrasek, Jr., and I. M. Rice.
In: 3rd National Conference on Complete WaterReuse, June 27-30, 1976, Cincinnati, Ohio, p. 556-566, 11 fig, 13 tab, 5 ref.

Descriptors: *Waste water treatment, *Metals, *Coliforms, *Coagulation, Biological treatment, Activated sludge, Flocculation, Filtration, Adsorption, Chemical oxygen demand, Carbon, Organic compounds, Nitrogen, Nitrates, Ion exchange, Microorganisms, *Water reuse, Lime, Evaluation, Performance, Treatment facilities, Denitrification.
Identifiers: Recarbonation.

Various waste water treatment sequences were evaluated as part of a research program for developing water reuse systems. The treatment sequences evaluated consisted of the following unit processes operating in series, with the most significant difference being the type of chemical treatment utilized in the sequence: biological treatment with completely mixed activated sludge, chemical coagulation, flocculation, and clarification, multi-media filtration, and activated carbon adsorption. A chemical treatment sequence employing high pH lime coagulation and recarbonation appeared to result in the best metals removals. High pH lime coagulation was also very effective for removing indicator (coliforms) of pathogenic bacteria. Low chemical oxygen demand and soluble total organic carbon concentrations were obtained with all of the treatment processes investigated. Nitrogen removal was not a problem because of uncontrolled denitrification in the final clarifier on the activated sludge system. However, nitrate nitrogen concentrations did closely approach the 10 mg/liter standard, and the addition of an anion exchange system capable of processing about 25% of the total product water appears desirable. (See also W76-11257) (Kreager-FIRL)
W76-11272

WATER FACTORY 21.
Orange County Water District, Fountain Valley, Calif. Board of Directors.
D. G. Argo.
In: 3rd National Conference on Complete WaterReuse, June 27-30, 1976, Cincinnati, Ohio, p. 567-577, 16 fig, 3 tab, 5 ref.

Descriptors: *Waste water treatment, *Reclamation, *Treatment facilities, *On-site tests, *Reclaimed water, *Water reuse, Organic compounds, Viruses, Turbidity, Heavy metals, Bacteria, Coagulation, Lime, Adsorption, Activated carbon, Chlorination, Filtration, Ammonia, Design criteria, Performance.
Identifiers: Recarbonation, Ammonia stripping.

The design and start-up of a full-scale advanced design waste water reclamation plant that is part of the Orange County California Water Factory 21 are described. The waste water reclamation plant is designed to treat 15 mgd of trickling filtered secondary effluent. The plant processes include: lime coagulation, ammonia stripping, two-stage recarbonation, mixed-media filtration, activated carbon adsorption, chlorination, and blending. During the initial start-up of the plant, its ability to meet its discharge objectives was demonstrated for all parameters except mineral quality. The plant effectively removed organics, turbidity, heavy metals, bacteria, and viruses. A waste water demineralization plant is being constructed so that the mineral quality objective can be attained. Detailed diagrams are illustrated for each process and plant effluent data are compared with discharge objectives. (See also W76-11257) (Kreager-FIRL)
W76-11273

FLY ASH - A POTENTIAL ASSET IN WASTE-WATER TREATMENT.
Northwestern Univ., Evanston, Ill.
N. Gangoli, and G. Thodos.
In: 3rd National Conference on Complete WaterReuse, June 27-30, 1976, Cincinnati, Ohio, p. 623-628, 4 tab, 29 ref.

Descriptors: *Fly ash, *Byproducts, *Waste water treatment, *Sludge treatment, Industrial wastes, Chemical oxygen demand, Organic compounds, Heavy metals, Phosphates, Dewatering, Phenol, Alkyl benzene sulfonate, Odor, Surfactants, Adsorption, Coagulation, Chemical precipitation.

Applications which utilize fly ash in waste water treatment operations are reviewed. Fly ash has been used as a filter aid in dewatering sewage sludges as a coagulant and precipitating agent, and for adsorbing dissolved substances in waste waters. In addition to enhancing the dewatering of activated and digested sludges, fly ash is also effective in removing organics and phosphates. Fly ash has been used as an adsorbent for the recovery of phenol from industrial waste waters and for the removal of alkyl benzene sulfonate, a surfactant used in detergents. Paper mill effluents have been treated with fly ash in eliminating of odor and the removal of chemical oxygen demand. The high alkalinity associated in fly ash makes this substance an excellent treatment aid for the precipitation of heavy metals present in the effluent streams of electroplating and metal finishing industries. (See also W76-11257) (Kreager-FIRL)
W76-11274

A SIMULATION MODEL FOR PHOSPHORUS WASTE DISCHARGES IN THE LAKE ERIE BASIN.
Case Western Reserve Univ., Cleveland, Ohio. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5B.
W76-11317

FEASIBILITY OF CHLORINATING FEEDLOT RUNOFF TO MEET BACTERIAL WATER QUALITY STANDARDS.
Maryland Univ., College Park. Dept. of Agricultural Engineering.
J. A. Merkel.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-256 576, $3.50 in paper copy, $3.00 in microfiche. Maryland Water Resources Research Center, College Park, Technical Report No. 37, (1976). 15 p, 5 tab. OWRT A-024-Md(1) 14-13-0001-5020.

Descriptors: *Agricultural runoff, Organic wastes, Runoff, Coliforms, Chesapeake Bay, *Salinity, Livestock, *Chlorination, *Feed lots, *Farm wastes, Water quality standards, *Waste water treatment, Bacteria, *Bactericides.
Identifiers: Detention ponds.

An increase in livestock production along with a more intensive usage of the Chesapeake Bay by boaters, vacationers, and the local population has placed increased demands on the organic carrying capacity of the Bay and its tributaries. This situation was brought into focus in 1971 when the Maryland State Department of Health and Mental Hygiene was forced to close certain shellfish waters and issue cease and desist orders to tweny livestock producers due to bacterial counts that exceeded water quality standards. Part of the problem was believed to be the result of runoff from poorly designed and managed livestock waste handling practices. The primary purpose of this study was to determine the parameters that could be used for effectively treating effluent from livestock operations before discharging it into streams. The results indicate that 'tailing' or increasing the salinity of the effluent is an effective means of reducing the bacterial population of the liquid waste. This technique coupled with detention ponds, provides a method for controlling the quality of the runoff before it is allowed to enter shellfish areas.
W76-11334

IDENTIFICATION OF STABLE ORGANIC COMPOUNDS IN WASTE EFFLUENT.
Connecticut Univ., Storrs. Inst of Water Resources.
For primary bibliographic entry see Field 5A.
W76-11338

BIOLOGICAL PURIFICATION OF HIGHLY CONCENTRATED SPENT SODIUM SULFITE PULPING LIQUORS (ETUDE DE L'EPURATION BIOLOGIQUE DE LESSIVES RESIDUAIRES AU SULFITE DE SODIUM DE FORTE CONCENTRATION).
Grenoble University, Grenoble, France.
J. Quilès-Mottiaux.
Ph.D. Thesis, 1971, 116 p, 36 plates, 24 fig, 49 ref, 23 tab.

Descriptors: *Sulfite liquors, *Pulp wastes, *Biological treatment, *Waste water treatment, Wastes, Industrial wastes, Aeration, Waste treatment, Temperature, Hydrogen ion concentration, Nutrients, Biochemical oxygen demand, Microorganisms, Chemical precipitation, Chemical degradation, Ozone, Color, Water pollution treatment, Water pollution control, Hardwood, *Chemical oxygen demand.
Identifiers: NSSC (Neutral sulfite semichemical) pulping.

Studies on the biological purification of concentrated spent liquors from the NSSC (neutral sulfite semichemical) pulping of hardwoods are reported. Following preliminary investigations on the development of microorganisms, the optimum composition of the medium, and optimum aeration conditions, temperature, pH, and nutrient additions, discontinuous biological purification tests were carried out using a tenfold spent liquor dilution, temperature of 25C, pH of 8.5, treatment period of 48 hr, and specific N, P, K, Mg, Mo, and Mn nutrient additions. The 5-day BOD of the spent liquor was found to decrease from 3500 (tenfold diluted liquor) to 650 mg/liter. This was followed in turn, by semi-industrial continuous tests (8-fold liquor dilution, 25C, 24 hr), using a special strain capable of developing in concentrated liquor. BOD was again reduced to 650 mg/liter (86%), COD from 43,700 to 20,600 mg/liter (53%). Two methods were then examined for further reduction of COD, viz., removal of pollutants via precipitation, and chemical degradation of liquor constituents. Best results were obtained with ozone treatment. When followed by biological purification, ozone gave a BOD reduction of 98.8% and a COD reduction of 70%. Significant decoloration of the effluent was also obtained. (Speckhard-IPC)
W76-11364

THE IMPACT OF VACATION HOMES ON NATIONAL FOREST WATER RESOURCES.
Arizona State Univ., Tempe. Coll. of Engineering Sciences.
For primary bibliographic entry see Field 5G.
W76-11366

...AND TREATMENT AND DISPOSAL OF MU-
...ICIPAL AND INDUSTRIAL WASTEWATER.
...lontana State Univ., Bozeman. Dept. of Civil En-
...neering and Engineering Mechanics.
...nn Arbor Science Publishers Inc., Ann Arbor,
...ichigan. 1976. 310 p. Sanks, R. L., and Asano, T.
...ditors).

...escriptors: *Industrial wastes, *Municipal
...astes, *Waste water disposal, *Soil disposal
...ld, Water pollution sources, Wastes, Nutrients,
...gronomic crops, Groundwater recharge, Soil
...eatment, Treatment facilities, Conference,
...blications, Regulation, Public health, Farm
...astes, Infiltration, Percolation, Land manage-
...nt, Irrigation, Spraying, Design, Operation and
...aintenance, Water pollution control, Disposal,
...aste disposal.

...e practice of applying municipal and industrial
...aste waters, treated effluents, and sludges to
...d has received attention for over a decade.
...iginally thought of only as a convenient means
...waste disposal, newer goals include the utiliza-
...n of dissolved nutrients by agricultural crops
...d tertiary (or advanced) treatment of water
...charges to improve stream quality of recharge
...ling groundwater tables. As an aid to engineers
...d scientists investigating, planning, or designing
...l-treatment and wastewater-disposal systems,
...s book is an outgrowth of the proceedings of the
...Environmental Engineers' Conference held at
...ntana State University. Some original contribu-
...ns (by different authors) were revised and many
...ones added. The 15 chapters deal with the fol-
...ing details: Land treatment of wastewaters –
...titutional and regulatory approach, use of the
...l-vegetation biosystem for wastewater
...cling, treatment processes and environmental
...pacts of waste effluent disposal on land, ac-
...ptability of wastewater effluents by soils; public
...lth aspects of land application of wastewater,
...d disposal of liquid industrial wastes, applica-
...n of agricultural wastes to land, potential
...blems of land application of domestic waste-
...ers, land treatment of wastewater by infiltra-
...-percolation; engineering investigations for
...d treatment and disposal; design and operation
...spray irrigation facilities; and review of the
...skegon County wastewater management
...tem. An index is appended. (Brown-IPC)
...6-11370

...ATUS OF THE NPDES (NATIONAL POLLU-
...NT DISCHARGE ELIMINATION SYSTEM)
...THE SOUTHEAST.
...ironmental Protection Agency, Atlanta, Ga.
...ion IV.
...primary bibliographic entry see Field 5G.
...5-11371

...STING AND APPLICATION OF STATIC
...RATORS.
...ll (Gerry) Environmental Engineers, Brent-
...d, Tenn.
...hell, and R. Stein.
...TAPPI Environmental Conference, Atlanta,
...rgia, April 26-28, 1976. Preprinted Proceedings
...PPI, Atlanta, Georgia), p 45-57, 5 fig, 4 ref, 2

...criptors: *Aeration, *Waste water treatment,
...ipment, *Testing, Oxygenation, Water purifi-
...n, *Operation and maintenance, Waste treat-
...t, Water pollution treatment, Mathematical
...els, Waste treatment, Water quality control,
... and paper industry.
...tifiers: *Aerators.

...rating parameters of over 200 aeration tests
...pleted on 7 different commercial designs of
...erged static aerators were evaluated. The
...lts indicated that the oxygen transfer rate for
...various designs ranged from 5 to 20% greater
...an open tube. Operating depths of 10, 15, and
... were evaluated at air flow rates ranging from 20 to 70 std. cu ft/min/tube. There was no indication of flooding or loss of oxygen transfer with increased air flow. The oxygen transfer efficiency was relatively constant throughout the normal operating air flow range. The submerged static aerator is an attractive alternative aeration equipment for waste water treatment. Various methods of testing and evaluating aerators and mathematical models which have been used are discussed. (Sykes-IPC)
W76-11372

EXTENDED AERATION IN A COMBINED WASTEWATER TREATMENT PLANT.
Jordan, Jones and Goulding, Inc., Atlanta, Ga.
B. G. Turner, E. A. Clark, M. H. Poythress, and J. P. McHugh.
In: TAPPI Environmental Conference, Atlanta, Georgia, April 26-28, 1976, Preprinted Proceedings (TAPPI, Atlanta, Georgia), p 65-79, 6 fig, 3 ref, 10 tab.

Descriptors: *Waste water treatment, *Pulp wastes, *Treatment facilities, *Municipal wastes, Water pollution sources, Water pollution treatment, Water pollution control, Wastes, Waste treatment, Industrial wastes, *Georgia, Aerated lagoons, Water purification, Sludge disposal, Operation and maintenance, Water quality control, Sewage treatment, Dissolved oxygen, *Aeration.
Identifiers: Kraft mills, Board mills, Ocmulgee River/Ga), *Extended aeration, Combined treatment.

A 14 million gal/day effluent treatment plant was placed in operation in spring, 1975, to purify Georgia Kraft Co.'s 900 ton/day kraft linerboard mill discharges along with 5 million gal/day of primarily domestic wastewater from the city of Macon, Georgia. The linerboard mill has implemented steps to improve and reduce its effluent discharges. The water pollution control plant (designed after extensive pilot plant studies) operates without primary clarification and includes two aeration basins (7 million gallon capacity each), each equipped with five 125-hp mechanical aerators, and two 115-ft diameter secondary clarifiers. Waste sludge is discharged to a short-term aerated holding basin with sludge-decanting capability. A series of sludge-disposal evaluations involving pilot and bench-scale studies of various types of sludge-dewatering and disposal equipment have been conducted. Operating experience with the plant is reviewed. Certain difficulties with solids settleability have caused poorer than desired effluent characteristics, but reasonable solutions to this problem are available. Water quality on the Ocmulgee River downstream from Macon has improved. In the summer of 1975, the lowest dissolved oxygen level did not violate stream standards. Otherstream quality parameters show similar improvement. (Sykes-IPC)
W76-11375

BIOMETER MEASUREMENT OF ACTIVATED SLUDGE AT WESTVACO CORPORATION.
Westvaco Corp., Covington, Va. Covington Research Center.
O. A. Campbell, and W. D. Major.
In: TAPPI Environmental Conference, Atlanta, Georgia, April 26-28, 1976, Preprinted Proceedings (TAPPI, Atlanta, Georgia), p 122-140, 10 fig, 15 ref, 2 tab.

Descriptors: *Activated sludge, *Pulp wastes, *Waste water treatment, *Biomass, *Instrumentation, Wastes, Industrial wastes, Waste treatment, Bioluminescence, Biochemical oxygen demand, Chemical oxygen demand, Oxygen requirements, Photometry, Suspended solids, Enzymes, Water pollution treatment, Water pollution control, Analytical techniques, Virginia, Pollutant identification.
Identifiers: DuPont 760 Luminescence Biometer.

The DuPont 760 Luminescence Biometer used for this study is a sensitive photometer designed to measure bioluminescence released by the firefly luciferase-luciferin reaction. In this manner, adenosine triphosphate (ATP) enzyme, a constituent of all living cells, can be measured and related quantitatively to viable cells (biomass) in pure cultures. Objectives of the described project were to determine quantitatively the amount of viable matter in the final effluent suspended solids as well as other points in a waste treatment plant, and to investigate the feasibility of using biomass measurement as an operating parameter. An attempt was made to relate biomass to plant performance (BOD removal, COD, and oxygen uptake). The Biometer detected biomass, however, the quantitative relationship to specific numbers (colonies) or to weight of living matter is questionable in mixed cultures. Relative levels of biomass in the water treatment plant were established and were relatively consistent. Substantial dynamic changes in biomass in activated sludge, if they occur, were not detected with the Biometer in these tests. Biomass measurements do not relate to performance. (Sykes-IPC)
W76-11375

PROCESS WASTEWATER: RECLAMATION OR DISPOSAL.
Sandwell International Inc., Atlanta, Ga.
P. H. Rath.
In: TAPPI Environmental Conference, Atlanta, Georgia, April 26-28, 1976, Preprinted Proceedings (TAPPI, Atlanta, Georgia), p 109-113, 4 tab.

Descriptors: *Pulp wastes, *Biological treatment, *Water reuse, *Waste water disposal, Wastes, Industrial wastes, Waste water treatment, Water pollution sources, Water pollution control, Water pollution treatment, Activated sludge, Economics, Suspended solids, Capital costs, Treatment facilities, Legislation, Water consumption/Except consumptive use), Water conservation.
Identifiers: Kraft mills, Spills, Process waste water.

Biological treatment is the predominant means chosen by the U.S. pulp and paper industry to comply with 1977 discharge limits. Two mills (a 250 ton/day kraft pulp and paper mill producing specialty papers and a 1000 ton/day kraft pulp and paper mill producing linerboard, sack paper, and bleached market pulp) having activated sludge plants have evaluated installation of new facilities for spill collection, foul condensate treatment and waste water volume reduction. The economic justification for these in-plant changes is summarized. The impact of proposed 1983 discharge limits on existing mills is summarized with reference to in-plant conditions and reuse potential of treated wastewater. In-plant reduction of wastewater volume is beneficial in reducing total effluent suspended solids, lowering capital cost of new treatment facilities, and providing production cost savings, and is essential for stable operation of an activated sludge plant. Treated effluent reuse potential for most integrated mills is in the range of 5 to 20% of total mill water requirements. Additional treatment to the 1983 discharge compliance level will not significantly increase the suitability of final effluent for reuse. Most existing mills will be forced to install additional external treatment facilities to meet 1983 discharge limits. Expenditures for such external treatment facilities can be minimized by reducing process water consumption. (Sykes-IPC)
W76-11376

CHESAPEAKE CORPORATION OPERATING EXPERIENCE WITH A HIGH PURITY OXYGEN ACTIVATED SLUDGE WASTE TREATMENT SYSTEM.
Chesapeake Corp. of Virginia, West Point.
K. R. Gilbreath.
In: TAPPI Environmental Conference, Atlanta, Georgia, April 26-28, 1976, Preprinted Proceedings (TAPPI, Atlanta, Georgia), p 141-144, 1 fig, 2 tab.

Descriptors: *Pulp wastes, *Waste water treatment, *Activated sludge, *Oxygen, Wastes, Industrial wastes, Waste treatment, Water pollution sources, Water pollution treatment, Water pollution control, Virginia, Treatment facilities, Water purification, Biochemical oxygen demand, Microorganisms, Suspended solids, Biological treatment, Operation and maintenance, Virginia.
Identifiers: Kraft mills, UNOX process.

Chesapeake Corporation (West Point, Virginia) has operated a high-purity oxygen activated sludge treatment system on kraft mill effluent since May 1974. The wastewater treatment facility consists of a single primary clarifier, a three-cell cooling tower, a three-stage UNOX oxygen activated sludge basin, two secondary clarifiers, a sludge thickener-clarifier, and two coil-spring vacuum filters. With such a system, high BOD-removal efficiency is maintained even when filamentous organisms are present. Abrupt changes in the influent wastewater characteristics only slightly affected the effluent's 5-day BOD. Effluent total suspended solids concentration was more susceptible to fluctuation in the influent wastewater characteristics. The presence of filamentous organisms raises the effluent total suspended solids concentration and makes the system more susceptible to upsets. The biological system averaged 92-94% removal of BOD with an average effluent concentration of 30 mg/liter without filamentous organisms present and 90-94% BOD removal with an average effluent concentration of 32 mg/liter with filamentous organisms present. The effluent total suspended solids averaged 40 mg/liter without organisms and 75 mg/liter with organisms present. Settling characteristics of the biological organisms also deteriorated with filamentous organisms present as noted by an increase in the sludge volume index from 50 to 90 and by a decrease in the initial settling velocity from 5.5 to 3.5 ft/hr. (Sykes-IPC)
W76-11377

RESEARCH ON THE MECHANISMS FOR REMOVAL OF SOLUBLE BOD(5) IN CLARIFIER SYSTEMS,
Institute of Paper Chemistry, Appleton, Wis.
G. A. Dubey, A. J. Wiley, and J. W. Collins.
In: TAPPI Environmental Conference, Atlanta, Georgia, April 26-28, 1976, Preprinted Proceedings (TAPPI, Atlanta, Georgia), p 145-155. 4 fig, 10 ref, 16 tab.

Descriptors: *Pulp wastes, *Waste water treatment, *Biochemical oxygen demand, *Water purification, Wastes, Industrial wastes, Waste treatment, Water pollution sources, Water pollution treatment, Water pollution control, Iron compounds, Hydrogen ion concentration, Solubility, Flocculation, Costs, Chemical precipitation, Laboratory tests, Chromatography, Water pollution, Water quality.
Identifiers: Ferric chloride, Aluminum sulfate, *BOD5.

Primary clarifiers used for the treatment of wastes from the pulp and paper industry vary widely in the amount of 5-day BOD they remove. In a survey of effluents from 19 pulp and paper mills (9 with clarifiers), it was found that a large part of the 5-day BOD was due to soluble materials. Analyses of effluent from mills having clarifiers indicated a large proportion of 5-day BOD remaining in the discharge streams was also due to soluble components. The soluble 5-day BOD was markedly reduced in a number of mill effluents with ferric chloride and alum under carefully controlled laboratory conditions. Gel chromatographic studies with mill effluents before and after clarification and work done with model compounds in pure solution showed that the soluble 5-day BOD components which were removed could be both high- and low- molecular weight compounds. The removal is apparently related to the pH of the solution and to the functional groups (hydroxyl, phenol, or carboxyl), chain length, branching, and solubility of the compounds. Decreased costs and increased operating efficiency in the primary clarifiers using flocculating agents to remove 5-day BOD depends on the reduction, elimination and/or separate treatment of streams which are detrimental to the system. (Sykes-IPC)
W76-11378

BOARD MILL WASTEWATER TREATMENT SYSTEM WITH COUNTERCURRENT DISSOLVED AIR FLOTATION THICKENING AND VACUUM FILTER DEWATERING,
Ingersoll-Rand Co., Nashua, N.H.
J. T. Albert, and A. R. Taylor.
In: TAPPI Environmental Conference, Atlanta, Georgia, April 26-28, 1976. Preprinted Proceedings (TAPPI, Atlanta, Georgia), p 197-199. 1 fig, 2 tab.

Descriptors: *Pulp wastes, *Waste water treatment, *Flotation, *Filtration, Wastes, Industrial wastes, Waste treatment, Water pollution sources, Water pollution treatment, Water pollution control, Biochemical oxygen demand, Suspended solids, New Hampshire, Treatment facilities, Equipment, Sewage treatment, Dewatering, Filters.
Identifiers: Board mills, Hoague-Sprague Boxboard Mill(West Haven N.H.).

A newly developed countercurrent flotation separation (CFS) and a traveling-belt vacuum filtration system proved to be an effective method to treat board mill wastewater at the Hoague-Sprague Boxboard Mill in West Haven, New Hampshire. The CFS unit reduces the influent suspended solids ranging from 990-3758 mg/liter to 24-93 mg/liter (92-98% removal) and the 5-day BOD by 25-43%, resulting in an effluent BOD of 649-2067 mg/liter. The effluent BOD is reduced further by secondary treatment. Floated solids are concentrated to 6.4-9.3% and dewatered by the traveling-belt vacuum filter at 4.2-5.2 lb/sq ft/hr loading rate. The dry solids in the filter cake range between 19.3 and 22.3%. (Sykes-IPC)
W76-11380

UNOX SECONDARY SLUDGE DEWATERING STUDIES AT LONGVIEW FIBRE COMPANY,
Longview Fibre Co., Wash.
J. E. Goodwin.
In: TAPPI Environmental Conference, Atlanta, Georgia, April 26-28, 1976, Preprinted Proceedings (TAPPI, Atlanta, Georgia), p 221-224. 9 tab.

Descriptors: *Sludge treatment, *Pulp wastes, *Dewatering, Wastes, Industrial wastes, *Waste water treatment, Water pollution sources, Water pollution treatment, Sludge disposal, Incineration, Equipment, Centrifugation, Filters, Aerobic treatment, Drying, Solid wastes, Water pollution control, Washington.
Identifiers: Tate-Andritz belt press, UNOX process.

A secondary sludge-dewatering system was initiated at Longview Fibre Company (Longview, Washington) in conjunction with a UNOX secondary treatment system. Sludge disposal via injection into the lime mud vacuum filters or the centrifuges, and via dewatering and incineration were investigated. Equipment evaluated during the dewatering studies included basket centrifuges, solid-bowl centrifuges, coil filters, pressure filters, belt presses, drying beds, gravity thickeners, and aerobic digesters. Results of the study indicated injection of the sludge into the mill system was not feasible. The injection of dilute secondary sludge into the lime mud system decreased the cake solids delivered to the kilns, necessitating the use of greater quantities of fuel. Of the dewatering devices tested, the Tate-Andritz twin-wire belt press gave the most reliable operation with acceptable solids yield. (Sykes-IPC)
W76-11381

HANDLING AND DISPOSAL OF BLEACH PLANT EFFLUENTS,
Longview Fibre Co. Wash.
R. G. Elliott, F. Howard, M. Gould, S. Rock, and T. Farr.
In: TAPPI Alkaline Pulping Conference, Williamsburg, Virginia, October 27-29, 1975. Preprinted Proceedings (TAPPI, Atlanta, Georgia), p 37-40.

Descriptors: *Bleaching wastes, *Waste water treatment, *Pulp and paper industry, Lime, Hydrogen ion concentration, Color, Biochemical oxygen demand, Ion exchange Resins, Wastes, Industrial wastes, Water pollution sources, Water pollution treatment, Water pollution control, Waste disposal, Chemical recovery, Effluents, Waste treatment.
Identifiers: Amberlite, Alkaline extraction, Kraft mills.

This transcript of the Bleaching Round Table presented at the 1974 TAPPI Alkaline Pulping Conference (Seattle, Washington), discusses the use of lime or lime mud for effluent pH control, lime treatment for effluent color and BOD reduction, use of polymeric absorbents (such as Amberlite XAD-8 resin) for reducing effluent color and BOD, and incorporation of caustic extraction effluent into kraft chemical recovery. (Witt-IPC)
W76-11383

WET AIR OXIDATION AT ONTONAGON,
Hoerner Waldorf Corp., Ontonagon, Mich.
J. E. Hoeft, and C. L. Soukup.
In: TAPPI Alkaline Pulping Conference, Williamsburg, Virginia, October 27-29, 1975. Preprinted Proceedings (TAPPI, Atlanta, Georgia), p 37-40. 1 fig.

Descriptors: *Pulp wastes, *Waste water treatment, *Oxidation, Wastes, Industrial wastes, Water pollution sources, Water pollution treatment, Michigan, Municipal wastes, Treatment facilities, Electric power, Water pollution control, Waste treatment, Aeration.
Identifiers: *Wet air oxidation, Semichemical pulp mills, Chemical recovery, Corrugating medium, Compressed air.

Faced with the dual problem of complying with stringent new air and water pollution standards, and the need to increase productivity to make such compliance economically feasible, Hoerner Waldorf Corporation opted for a unique semichemical pulping, recovery, and waste treatment system at its Ontonagon, Michigan, paper mill. The Zimpro wet air oxidation system replaced the existing recovery furnace which did not meet environmental standards of the state of Michigan. The system is based on the scientific principle that organic material in aqueous solution can be oxidized to carbon dioxide and water by air, under pressure and at temperatures of 350-700F. The system recovers pulping chemicals, generating energy during the process, and treats both mill effluent and municipal sewage from the village of Ontonagon. The cost of these environmetal improvements made it necessary for the company to add a second paper machine. The mill produces corrugating medium. (Witt-IPC)
W76-11384

WATER REUSE AND RECYCLE IN THE C(D)EHDED BLEACH SEQUENCE,
CIP Research Ltd., Hawkesbury (Ontario).
For primary bibliographic entry see Field 3E.
W76-11385

CLARIFIERS WITH SUSPENDED SEDIMENT LAYER FOR THE PURIFICATION OF EFFLUENTS (OSVETLITELI SO VZVESHENNYM SLOEM OSADKA DLYA OCHISTKI STOCHNYKH VOD),
Vsesoyuznyi Nauchnyi Planovii Otdel Bumazhno Promyshlennost Moscow (USSR).

A. Romanov, G. P. Kuchin, and Yu. M.
irnov.
mazhnaya Promyshlennost, No. 2, p 22-23,
bruary, 1976. 1 fig, 1 tab.

scriptors: *Water purification, *Pulp and paper
ustry, Equipment, Wastes, Industrial wastes,
ste treatment, *Waste water treatment, Water
lution treatment, Water pollution sources, Set-
g basins, Effluents, Water pollution control,
spended solids, Water reuse.
ntifiers: Clarifiers.

rifiers with suspended filtering layers are suc-
sfully used for the purification of natural
ers, effluents from viscose rayon factories,
in other branches of industry. A clarifier based
the same principle, specifically designed for
er industry effluent containing fibers and fil-
, is described. The purification effect, as
wn by laboratory and pilot plant tests is 96-
, so that the clarified effluent can be recycled.
sediment is suitable for reuse in the manufac-
of low-grade papers and boards. The residual
ds content in the clarified effluent does not ex-
l 10-15 mg/liter. Clarifiers of this type have
n introduced at two board mills, giving a purifi-
on of 96-97% for fibers and 80-85% for kaolin.
ger clarifiers, i.e., 20 m in diameter with a
acity of 1200-1300 cu m/hr, are under develop-
t. (Stapinski-IPC)
6-11388

**THOD OF CONTROLLING THE PROCESS
CHEMICAL PURIFICATION OF EF-
ENTS (SPOSOB OPERATAIVNOGO
AVLENIYA PROTSESSOM
MICHESKOI OCHISTKI STOCHNYKH
)),**
oyuznyi Nauchnyi Planovyi Otdel Bumazh-
Promyshlennost, Moscow (USSR).
Alesina, M. M. Krunchak, V. P. Semenov, V.
nizovskii, and A. F. Milagin.
azhnaya Promyshlennost, No. 1, p 22-23,
ary, 1976. 1 fig, 1 tab.

riptors: *Pulp wastes, *Waste water treat-
, *Water purification, *Coagulation, Wastes,
strial wastes, Water pollution treatment,
r pollution sources, Alkalinity, Color,
rolysis, Hydrogen ion concentration,
ralization, Waste treatment, Chemical
pitation, Sorption, Statistical methods.
ifiers: Aluminum sulfate, Sulfuric acid, Alu-
m hydroxide, Kraft mills.

ical purification of kraft mill effluent with
num sulfate, which involves the sorption of
tants on aluminum hydroxide, requires a suf-
t alkalinity in the effluent for the formation
e sorbent (aluminum hydroxide). Therefore,
lations between the dose of coagulant and
the alkalinity and color of the effluent were
igated. Mill practice shows that in many
the alkalinity of the effluent is higher than
sary for hydrolysis of the amount of alu-
n sulfate needed, and an excess must be used
ain the optimum pH for coagulation. In such
the amount of aluminum sulfate can be
ed by partially neutralizing the effluent with
ic acid. Based on experimental data and their
ical analysis, functional relations were
d (1) between the dose of coagulant and al-
y (for practical purposes the dose equals al-
y), (2) between the optimum dose after the
um possible reduction of alkalinity, and (3)
en the amount of sulfuric acid which can be
to the alkalinity and color of the effluent.
e of these relations will eliminate time-con-
g coagulation tests to determine the needed
f coagulant. (Stapinski-IPC)
1389

INTENSIFICATION OF BIOLOGICAL PURIFICATION OF EFFLUENTS (INTENSIFIKATSIYA BIOLOGICHESKOI OCHISTKI STOKOV),
I. S. Levit, S. F. Bin'kovskii, A. I. Zatsepilin, G. S. Burin, and M. A. Evilevich.
Bumazhnaya Promyshlennost, No. 2, p 21, February, 1976. 1 tab.

Descriptors: *Biological treatment, *Waste water treatment, *Pulp wastes, Wastes, Industrial wastes, Water pollution sources, Water pollution treatment, Water pollution control, Activated sludge, Settling basins, Aeration, Sludge, Water purification, Biochemical oxygen demand, Costs, Effluents, Water quality control, Waste treatment.
Identifiers: USSR.

One of the newest methods of intensification of effluent purification, the biosorption method, has been recently introduced at the Bratsk wood-processing complex (Siberia). This method consists in adding the excess activated sludge to the effluent in the primary sedimentation tank, aerating the mixture for a short time, and separating the sediment along with the sludge. Studies of this process have shown that in the presence of activated sludge (in an amount considerably smaller than in the aeration tank) and aeration (for about 3 hr) the degree of effluent clarification increasess by 20%, and its BOD is reduced by about 30%. This increases the degree of biological purification in the aeration tanks from 94.5 to 97.5%. At the same time the process increases the capacity of the purification equipment (in terms of BOD) by 12.4% and reduces the cost of purification. The method is particularly well suited for highly polluted effluents. (Stapinski-IPC)
W76-11391

IMPROVED SYSTEM FOR THE PURIFICATION OF WASTE WATERS AT THE LVOV BOARD MILL (UDOSKONALENA SKHEMA OCHISTKI STICHNIKH VOD NA 1'VIVS'KIIKARTONI FABRITSI,
B. M. Stelmakh.
Lisova Gospodarstvo, Lisova Paperova, Derevoobrobna Promislovist, Vol. 6, p 21-22, 1974. 1 fig.

Descriptors: *Water reuse, *Waste water treatment, *Pulp wastes, Wastes, Industrial wastes, Water pollution sources, Water pollution treatment, Water pollution control, Waste treatment, Water purification, Recycling, Suspended solids, Hydrogen ion concentration, Chemical oxygen demand, Foreign countries, Industrial water, Chemical precipitation, Water conservation, Europe.
Identifiers: *White water(Paper machines), Aluminum sulfate, Polyacrylamide, Ukraine, Board mills, Fiber recovery, Closed systems, Waco filters, USSR.

The Ukrainian board mill in Lvov produces 31,000 tons of boxboard annually on two cylinder mold machines. The mill is experiencing a shortage of process water, as its sources are artesian wells, and is faced with the necessity of introducing a closed water cycle. The first step in this direction was an improvement in the waste water treatment system to increase its degree of purification (which up to now was only 40-50%). This system is described and illustrated with a diagram. The fibers recovered from two Waco filters are reused in stock preparation. The partially clarified white water goes to two vertical sedimentation tanks where it is treated with aluminum sulfate and polyacrylamide. The degree of purification is presently 90%. The amount of aluminum sulfate added is 240 g/liter, the amount of polyacrylamide 10 g/liter. The purified white water, which can be recycled, contains 58 mg of suspended solids/liter, has a pH of 6.5, a COD of 192 mg/liter, and a permanganate oxidizability of 150 mg/liter. It is used for washing felts and cylinder mold wires. (Stapinski-IPC)
W76-11392

A CHEMICAL-BIOLOGICAL TREATMENT PROCESS FOR CELLULOSE NITRATE DISPOSAL,
Army Natick Development Center, Natick, Mass.
T. M. Wendt, and A. M. Kaplan.
Journal Water Pollution Control Federation, Vol. 48, No. 4, p 660-668, April, 1976. 2 fig, 24 ref, 3 tab.

Descriptors: *Biological treatment, *Waste water treatment, *Chemical degradation, Water pollution sources, Industrial wastes, Anaerobic digestion, Denitrification, Aerobic treatment, Activated sludge, *Nitrates, Biochemical oxygen demand, Carbon, Chemical oxygen demand, *Waste disposal, Water pollution control, Alkalis(Bases).
Identifiers: *Cellulose nitrate, Sodium hydroxide.

A newly developed means of disposing of cellulose nitrate involves chemical pretreatment of the biologically stable cellulose nitrate polymer, using an alkali (e.g., NaOH), followed by biological treatment. The biological treatment process consists of sequential anaerobic denitrification and aerobic activated sludge treatment steps. This continuous process reduces to nitrogen gas more than 95% of the nitrate produced during alkali digestion of cellulose nitrate and nitrate produced by nitrification in the aerobic portion of the process. Five-day BOD, total organic carbon, and COD removals averaged 88.6, 54.5, and 55.2%, respectively. The process provides an environmentally acceptable alternative to more common physical means of disposal such as open burning. (Witt-IPC)
W76-11395

POLLUTION MANAGEMENT IN THE PAPER AND PAPERBOARD INDUSTRY.
For primary bibliographic entry see Field 5G.
W76-11400

PROCESS FOR SEPARATING LIQUIDS FROM SUSPENSIONS,
Department of the Interior, Washington, D. C. Office of the Secretary. (Assignee).
L. W. Brandt.
U.S. Patent No. 3,956,116, 5 p, 3 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 946, No 2, p 728, May 11, 1976.

Descriptors: *Patents, *Waste water treatment, *Phosphates, *Water pollution sources, *Slime, Suspension, Suspended solids, Separation techniques, Water purification, Settling basins, Equipment, Screens.
Identifiers: Phosphate mining.

This invention relates to a process for accelerating the separation of liquid from solids in a very slow-settling suspension or a slime, by means of a single mechanical operation which effects the compaction of the solids in a relatively short period of time. The process involves the movement of a relatively large mesh screen or net through the suspension at a slow steady rate with the result that the solid material is concentrated or compacted ahead of the moving screen leaving a clarified liquid behind the moving screen. In some instances, there may be a flocculant material employed as an aid in agglomerating the ultrafine solids. It is an object of this invention to provide a rapid method for separating liquid from solids in very slow-settling suspension without the necessity of employing chemical additives or using centrifuges or filters and to provide an improved process for treating phosphate slime to recover clarified water and concentrated minerals. (Sinha-OEIS)
W76-11448

CATIONIC POLYMERS FOR BREAKING OIL-IN-WATER EMULSIONS,
Nalco Chemical Co., Oak Brook, Ill. (Assignee).
R. L. Bradley, A. J. Sadowski, and E. G. Ballweber.

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U.S. Patent No. 3,956,117, 4 p, 4 ref; Official Gazette of the United States Patent Office, Vol 946, No 2, p 728, May 11, 1976.

Descriptors: *Patents, *Industrial wastes, *Oil pollution, *Oily water, Water pollution treatment, Water pollution control, Water quality control, *Emulsions, Dispersion, Polymers, Flocculation, Separation techniques.
Identifiers: Oil-in-water emulsions.

A method has been discovered for resolving oil-in-water emulsions through the treatment of these emulsions with a water-soluble condensation copolymer of 1,4-dichloro-2-butene and a lower aliphatic secondary amine. Dispersing this water-soluble copolymer within the emulsion causes the emulsion to break and separate into an aqueous phase and an oil phase. The oil phase may then be removed by conventional methods. In one embodiment of the invention the addition and mixing of the water-soluble copolymer is followed by the addition and dispersal of one or more flocculants. The additional flocculants encourage rapid agglomeration of the flocs and thereby facilitate removal of the oil. (Sinha-OEIS)
W76-11449

FLOCCULATION PROCESS,
Mobil Oil Corp., New York. (Assignee).
J. C. Davidtz.
U.S. Patent No. 3,956,119, 6 p, 4 ref; Official Gazette of the United States Patent Office, Vol 946, No 2, p 729, May 11, 1976.

Descriptors: *Patents, *Waste disposal, *Phosphates, *Water pollution sources, *Flocculation, *Slime, Dewatering, Topsoil, Organic matter, Sludge disposal, Water reuse, Landfills, Settling basins.
Identifiers: Phosphate mining.

The dilute clay-containing slimes waste, formed in the hydraulic mining of phosphate mineral, is flocculated by mixing with an aqueous extract of fertile topsoil or with fertile topsoil which is the uppermost two feet or more of overburden that contains at least 200 parts per million organic matter extractable by water. Water is recovered from the flocculated mixture. The dewatered floc is preferably disposed at a land reclamation site and covered with overburden to restore the oridinal stable soil profile, i.e. an upper layer of soil with good drainage and a lower layer having poor drainage. One manner of utilizing the flocculated mixture of this invention is to store it in a quiescent state, i.e., without deliberate agitation other than that caused by wind, for a period of from 24 hours to about one month, in a pond or settling area. During such storage very effective sedimentation will occur with the copious formation of supernatant clear water than can be separated and returned for use in the mining process, or discharged to a river. (Sinha-OEIS)
W76-11451

PROCESS FOR THE PRECIPITATION OF HEAVY METAL ION-POLYCARBOXYLATE COMPLEXES,
Deutsche Gold- und Silber-Scheideanstalt A. G., Frankfurt-am-Main (West Germany).
H. Haschke, H. Knorre, G. Morlock, and G. Pohl.
U.S. Patent No. 3,956,121, 6 p, 4 ref; Official Gazette of the United States Patent Office, Vol 946, No 2, p 729-730, May 11, 1976.

Descriptors: *Patents, *Industrial wastes, *Water pollution treatment, Water pollution control, Water quality control, *Heavy metals, *Water pollution sources, Chemical wastes, *Chemical precipitation, Separation techniques.
Identifiers: Metal processing industry, Galvanizing.

This invention provides a process for the precipitation of heavy metal ion-poly-carboxylate complexes from their aqueous solutions. The process comprises first adding an aqueous solution of a water soluble aluminum salt, the anion of which does not form water soluble complexes with the metal ions to be precipitated or possibly such anion-heavy metal complexes having a stability constant of less than 2, expressed as its decadic (decimal)logarithm; to a solution containing the heavy metal ion-polycarboxylate complexes in such an amount that about 0.9 to 1,8 moles of aluminum ions are provided for each equivalent of the polycarboxylate. Subsequently, the pH is adjusted to about 6.5 to about 9.0. Both the complexing agents as well as the heavy metal ions are practically precipitated quantitatively. By the addition of the aluminum salt solution, the polycarboxylate-heavy metal ion-complexes are 're-complexed' to aluminum complexes. At the same time, the heavy metal ions liberated from the original complexes are precipitated as hydroxides or carbonates which are difficult to solubilize. The amorphous, voluminous aluminum complex possibly increases at the same time the quantitative separation of the heavy metals ions by producing an occluding effect. (Sinha-OEIS)
W76-11452

APPARATUS FOR DISPOSING OF ORGANIC WASTE MATERIALS,
For primary bibliographic entry see Field 5E.
W76-11455

UNDERDRAIN FOR WATER FILTRATION SYSTEM,
Hi-Ran Ltd., Charlotte, N. C. (Assignee).
For primary bibliographic entry see Field 5F.
W76-11458

PROCEEDINGS TENTH BIENNIAL CONFERENCE ON GROUND WATER, TOTAL WATER MANAGEMENT FOR CALIFORNIA'S LONG-RANGE NEEDS.
California State Dept. of Water Resources, Scramento.
For primary bibliographic entry see Field 4B.
W76-11491

AUXILIARY AGENTS USED IN TEXTILE FINISHING AS NEW COAGULANTS FOR EFFLUENTS (SRODKI POMOCNICZE STOSOWANE W WYKONCZALNICTWIE JAKO NOWE KOAGULANTY SCIEKOW PRZEMYSLU WLOKIENNICZEGO),
Centralne Laboratorium Dziewiarstwa (Poland).
J. Rouba.
Przeglad Wlokienniczy, Vol. 30, No. 1, p 46-48, January, 1976. 4 ref, 2 tab.

Descriptors: *Coagulation, *Waste water treatment, *Textiles, Wastes, Industrial wastes, Water pollution sources, Cations, Organic compounds, Foreign countries, Dyes, Water purification, Water pollution treatment, Water pollution control, Color, Biochemical oxygen demand, Separation techniques, Waste treatment.
Identifiers: Sedipur KA, Zabulen EP, Marwellan SF, Pilasol W, Direct dyes, Reactive dyes, *Poland, IS fixative.

Positive results obtained in coagulation of textile industry effluents with organic cationic compounds, such as Sedipur KA, prompted a search for more readily available domestic Polish coagulants. Some textile-finishing auxiliaries are cationic compounds. Preliminary experiments with two such agents produced in East Germany, Zabulen EP and Marwellan SF, gave encouraging results. These experiments were continued with a number of Polish additives. They were conducted on two types of concentrated cotton-dyeing effluents from the use of direct dyes and reactive dyes, respectively. Two agents, viz., Pilasol W and the fixative IS, gave good results with effluent containing direct dyes (complete decoloration, clarification, and considerable reduction of BOD). Only the fixative IS was effective in the case of effluent containing reactive dyes. (Stapinski-IPC)
W76-11501

COAGULATION OF TEXTILE INDUSTRY EFFLUENTS WITH FIXATIVE 'IS' (PROBY KOAGULACJI SCIEKOW PRZEMYSLU WLOKIENNICZEGO UTRWALACZEM IS),
Centralne Laboratorium Dziewiarstwa (Poland)
J. Rouba
Przeglad Wlokienniczy, Vol. 30, No. 2, p 94-96, February, 1976. 1 fig, 3 ref, 4 tab.

Descriptors: *Coagulation, *Waste water treatment, *Textiles, Europe, Wastes, Waste treatment, Industrial wastes, Water pollution sources, Water pollution treatment, Water pollution control, Color, Biochemical oxygen demand, Suspended solids, Surfactants, Cations, Organic compounds, Separation techniques, Sedimentation, Flotation, Water purification, Costs, Storage, Corrosion, Foreign countries
Identifiers: *IS fixative, *Poland

An earlier study of effluent coagulation with cationic compounds used in textile finishing showed that the fixative IS is the most effective. This agent is a condensation production of dicyandiamide with formaldehyde, and is produced at the Nitrogen Chemical plant in Kedzierzyn (Poland). When used for coagulation of total effluents from cotton-processing mills, it achieved complete decoloration, 50% BOD reduction, and 90% removal of suspended solids and anionic surfactants. Compared to inorganic coagulants, the cationic organic agents have the disadvantage of slow sedimentation and more difficult separation of the sediments. Laboratory experiments indicated that a faster and more convenient method of separation is pressure flotation. In about 15 minutes a good separation of the sediment from the coagulated effluent was obtained. The volume of the sediment was 3.8% of the coagulated effluent volume and its water content was 97.7%. Such sediments can be dewatered and then burned. Compared to inorganic coagulants, the cationic agents have the advantages of requiring a smaller dose, eliminating the introduction of water hardness salts into the purified effluent, and of lowering the costs of purification considerably. The IS fixative can be stored for at least one year and is noncorrosive. (Stapinski-IPC)
W76-11502

FLOCCULATION OF WASTEWATER WITH POLYELECTROLYTES AND FERRIC CHLORIDE,
Arizona Univ., Tucson. Dept. of Civil Engineering and Engineering Mechanics.
C. D. Walding.
Ph.D. Dissertation, 1975. 69 p, 3 tab, 20 fig, 24 ref.

Descriptors: *Flocculation, *Waste water treatment, *Polyelectrolytes, *Chlorides, Economic feasibility, Suspended solids, Polymers, Anions, Cations, Settling velocity, Chemicals, Testing, Costs.
Identifiers: *Ferric chloride.

Raw municipal wastewater can be efficiently and economically flocculated with polyelectrolytes and ferric chloride. Chemical and physical process variables which affect flocculation were studied, including flocculant types and dosages, suspended solids concentrations, chemical addition sequences and mixing intensities. Anionic polymers used following ferric chloride were more effective than cationic or nonionic types at equivalent dosages. The combined chemical system increases floc settling rates beyond those observed when using no chemicals or ferric chloride alone. Capital savings from more rapid settling rates can offset much of the cost of the chemicals. Experimental results are given for single and double flocculant systems, and cost op

zation is discussed. A bench scale modified jar was developed to improve sensitivity to initial ling rates. (Jahns-Arizona)
5-11520

MOVAL OF HYDROGEN SULFIDE FROM NKING AND INDUSTRIAL WATER, (IN SSIAN),
soyuznyi Nauchno-Issledovatelskii Institut osnabzheniya, Kanalizatsii, Gidrotekh-eskikh Sooruzhenii i Inzhenernoi ogeologii, Moscow (USSR).
primary bibliographic entry see Field 5F.
-11541

ERIENCE IN THE TREATMENT OF HLY-CONCENTRATED SPENT NATIVE UTION OF BENZYL PENICILLIN, (IN RUS-I),
oyuznyi Nauchno-Issledovatelskii Institut biotikov, Moscow (USSR).
Karpukhin, and S. V. Mosiichuk.
n-Farm Zh. 8(12), p 46-48, 1974.

riptors: Chemical oxygen demand, ation, Oxidation lagoon, Activated sludge, ozoa, Aerobic conditions, *Waste water treat-

ifiers: *Benzyl penicillin, Aeration tanks.

ment of spent native solution of benzyl illin, having a chemical oxygen demand of 0 mg/liter, was possible in aeration tanks ut dilution. The species composition of zoa indicated a good state of the activated e. Certain wastewater from the production of antibiotics can be treated by the aerobic emical method.--Copyright 1975, Biological acts, Inc.
11543

Y OF THE EFFECT OF WATER LINATED BY ELECTRODIALYSIS ON BIOLOGICAL OBJECTS, (IN RUSSIAN),
no-Issledovatelskii Institut Selskoi Gigieny, v (Gigieny).
Orlov.
nit. 6, p 90-92, 1974.

iptors: *Desalination, *Electrodialysis, ia, Potable water, Desalination plants, water treatment, Water supply.
fiers: Daphnia-Magna, *Activated charcoal.

s with Daphnia magnus and white rats d that water desalinated in the EOUNIIPM-EKhO-15-4P industrial desalination plants natural conditions with additional treatment ivated birch charcoal contains no toxic sub-s, is harmless and can be used for drinking. tivated charcoal filter is mandatory in elec-ysis desalting plants.--Copyright 1975, ical Abstracts, Inc.
1548

TA FALLS INTEGRATED MUNICIPAL MATION SYSTEM, WATER UTILITY SSING SYSTEM (WUPS), APPLICA-COMPLETION REPORT, VOLUME I.
mary bibliographic entry see Field 3D.
596

TA FALLS INTEGRATED MUNICIPAL MATION SYSTEM, WATER UTILITY SSING SYSTEM (WUPS), APPLICA-COMPLETION REPORT, VOLUME II.
mary bibliographic entry see Field 3D.
597

IDENTIFICATION OF ORGANIC COMPOUNDS IN EFFLUENTS FROM INDUSTRIAL SOURCES,
Versar, Inc., Springfield, Va. General Technologies Div.
For primary bibliographic entry see Field 5A.
W76-11598

URBAN STORMWATER MANAGEMENT MODELING AND DECISION-MAKING,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
J. P. Heaney, W. C. Huber, H. Sheikh, M. A. Medina, and J. Doyle.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-242 290, $7.50 in paper copy, $3.00 in microfiche. Report EPA-670/2-75-022, May, 1975. 185 p, 37 fig, 47 tab, 92 ref.

Descriptors: *Decision making, *Model studies, *Rainfall, Runoff, *Waste water treatment, Erosion control, Water storage, Vegetation, Optimization, Cost analysis, Storm drains, Combined sewers, Water pollution, Computer programs, Streams, Storm water, Urban runoff, Cities, Urbanization.
Identifiers: Stream pollution, Storm Water Management Model (SWMM).

The Environmental Protection Agency (EPA) Storm Water Management Model (SWMM) was tested, refined, and augmented to develop decision-making techniques for studying runoff problems. The refinements include incorporating a sediment prediction capability using the Universal Soil Loss Equation. Other refinements reflect recent developments such as swirl concentrators. The model was tested in Lancaster, Pennsylvania. Agreement between predicted and measured hydrographs and pollutographs was only fair, due to the very limited and somewhat questionable quantity and quality verification data available. Quality predictions and the limited measured data available were reasonably close for the Conestoga River, the receiving waterway. The refined and augmented model showed an improved capability to describe the various processes. The decision-making model examines stormwater management in the general context of water resources management. It indicates that urbanization results in significantly higher peak flows and substantially increased control costs. Interrelationships with flood control and drainage, street and parking lot design, and air pollution are included. Impervious areas associated with the automobile appear to be the most important source of stormwater problems. More efficient use of paved areas appears to reduce the problem. An optimization procedure for control strategies uses linear programming techniques and procedures from cooperative N-person game theory. The SWMM was also applied to preliminary hydraulic design of sewer systems. The runoff portion provided a more accurate inlet hydrograph. The transport portion analyzed the hydraulics of flow through sewers, including a routine that checks for surcharging. (Snyder-FIRL)
W76-11599

WATER QUALITY MANAGEMENT PLANNING FOR URBAN RUNOFF.
Environmental Protection Agency, Washington, D. C.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-241 689, $8.00 in paper copy, $3.00 in microfiche. Report EPA-440/9-75-004, December, 1974. 214 p, 36 fig, 38 tab, 160 ref, 4 append.

Descriptors: *Waste water treatment, Analytical techniques, *Water pollution, *Water quality, *Urban runoff, Storm runoff, Runoff forecasting, Snowmelt, Storms, Surface waters, *Planning, Cities, *City planning.
Identifiers: Surface water runoff, Urban planning.

Technical assistance is provided to state and local water quality management planners for identifying and characterizing urban runoff as a non-point source of water pollution without extensive data generation. Preliminary evaluation of cost effective abatement and control practices is also discussed. The analytical procedures are identified according to three levels, requiring increasingly more effort and yielding correspondingly higher degrees of accuracy. The characterization is limited to runoff from impervious surfaces, which is the predominant source of pollutants associated with urban stormwater. Analytical procedures to predict the quality, quantity, and rate of runoff from specified storm events are included. Examples illustrate these analytical methods and procedures. Runoff from sources such as urban irrigation and snowmelt is also included. General criteria for evaluating the water pollution potential of urban runoff, as well as methods for treatment, abatement, and ultimate disposal are discussed. Background information is provided, emphasizing recent studies. (Snyder-FIRL)
W76-11600

MERCURY IN LAUNDRY WASTEWATERS,
Illinois Inst. for Environmental Quality, Chicago.
J. W. Patterson.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-241 602, $4.50 in paper copy, $3.00 in microfiche. ILEQ Doc. No. 75-10, February, 1975. 45 p, 22 tab, 106 ref.

Descriptors: *Waste water treatment, *Mercury, *Laundering, *Waste water(Pollution), *Pollution abatement, Detergents, Fabrics, Chemicals, Adsorption, Activated carbon, Standards, Filtration.

Results of a study directed toward identifying sources of mercury in laundry are described, and the capability and technological feasibility of available mercury abatement procedures for laundry wastes are assessed. Perhaps half or more of the mercury in laundry waste water was removed from soiled fabrics during laundering. The other major source of mercury in laundry waste water is mercury contaminated laundering chemicals. Significant mercury content was indicated for caustic, hydroflurosilicic acid, bacteriostats and mildicides, and various soaps and fabric softeners which frequently contain bacteriostatic agents. Iron and calcium chloride coagulation and activated carbon adsorption have the capability to treat effluent to meet the Illinois effluent standard of 0.5 microgram/liter. Only activated carbon, however, would consistently achieve an effluent value below the Illinois standard for the mercury levels in commercial laundry waste water. It has been shown to reduce mercury levels to below 0.25 micrograms/liter on a commercial laundry waste. Mercury abatement by substituting mercury-free laundering chemicals is also possible. Laundering chemicals can also be pretreated to remove mercury before use. Filtering caustic prior to use could possibly reduce mercury in the waste water by as much as 40%. (Snyder-FIRL)
W76-11602

YIELD AND HEAVY METAL CONTENT OF FOOD CROPS GROWN ON SOILS AMENDED WITH SEWAGE SLUDGE,
California Univ., Riverside.
F. T. Bingham, G. A. Mitchell, R. J. Mahler, and A. L. Page.
In: International Conference on Environmental Sensing and Assessment, Vol. 2, September 14-19, 1975, Las Vegas, Nevada, p 30-6-1 - 30-6-4. 5 tab, 14 ref.

Descriptors: *Sewage sludge, *Heavy metals, *Plant growth, *Phytotoxicity, Crop production, Lettuce, Wheat, Cadmium, Zinc, Copper, Nickel, Soils.
Identifiers: *Land application.

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Wheat and Romaine lettuce were grown in two different soils (calcareous and acidic) treated with a sewage sludge enriched with sulfates of cadmium, copper, nickel, or zinc to test the availability of sludge-borne heavy metals to plants. The zinc, copper, nickel, and cadmium concentrations in wheat grain grown in soil with metal additions ranging from 0-160 micrograms/gram of soil ranged from 73-185, 7.1-11, less than 1.0-119, and less than 0.1-87 micrograms/gram of wheat, respectively. The corresponding values for Romaine lettuce were: 82-1058, 6.2-8.2, 3.5-345, and 1.6-593 micrograms/gram of lettuce, respectively. Cadmium was the most toxic in terms of curtailing crop yields. The pH of the soil also affected the growth of crops and the availability of sludge-borne heavy metals to plant tissue. (See also W76-10637) (Kreager-FIRL)
W76-11610

ENVIRONMENTAL ASSESSMENT OF MARINE OUTFALLS,
Environmental Protection Agency, Atlanta, Ga. Region IV.
For primary bibliographic entry see Field 5E.
W76-11615

MANAGEMENT AND FINANCING ALTERNATIVES FOR WASTE DISPOSAL IN COASTAL AREAS,
North Carolina Univ. at Chapel Hill. Inst. of Government.
For primary bibliographic entry see Field 5E.
W76-11616

DEEP WELL DISPOSAL OF WASTEWATER,
Environmental Protection Agency, Atlanta, Ga. Region IV.
For primary bibliographic entry see Field 5E.
W76-11617

THE AVAILABILITY OF DESALTING FOR WATER SUPPLY FROM SALINE SOURCES,
Office of Water Research an Technology, Washington, D. C.
For primary bibliographic entry see Field 3A.
W76-11619

WASTEWATER REUSE IN COASTAL AREAS,
North Carolina Univ. at Chapel Hill. Dept. of Environmental Sciences and Engineering.
F. E. McJunkin.
In: Proceedings of the Southeastern Conference on Water Supply and Wastewater in Coastal Areas, April 2-4, 1975, Wilmington, North Carolina, Unversity of North Carolina, p 111-123. 2 tab, 7 ref.

Descriptors: *Waste water treatment, *Water supply, *Water demand, *Percolation, *Injection wells, *Water reuse, Water utilization, Coasts, Saline water intrusion, Septic tanks, Aquifers, Groundwater, Industrial water.

Prospects for waste water reuse in the southeastern coastal states are discussed. The potential for direct and indirect waste water reuse is especially high in areas where municipal water supply problems exist. Such areas include the southeastern coastal communities where water demand often exceeds conventional water supplies. Reuse for industrial supply appears to offer the greatest near-term potential for increasing available water resources. One type of reuse often practiced in coastal areas is the return of septic tank effluents or other waste waters to groundwater by percolation through the soil. This leads to the possibility of returning sewage plant effluent, via percolation or well injection, to groundwater aquifers where depletion or salt-water intrusion has occurred. The technology for meeting water standards required by the majority of industrial and agricultural uses is currently available for waste water treatment, and only economics seem to limit increased waste water reuse. Data on industrial users of reclaimed municipal waste water are tabulated along with the status of technology for removing common constituents in waste water. (See also W76-11224) (Kreager-FIRL)
W76-11620

MAN DISCOVERS THE COASTAL ENVIRONMENT: A FOOTPRINT IN THE SAND,
North Carolina State Univ. at Raleigh. University Studies.
J. C. Wallace.
In: Proceedings of the Southeastern Conference on Water Supply and Wastewater in Coastal Areas, April 2-4, 1975, Wilmington, North Carolina, University of North Carolina, p 133-138

Descriptors: *Coasts, *Planning, *Waste water treatment, *Legislation, Land use, Administration, Federal government, State governments, Federal Water Pollution Control Act.

Poor planning practices and their effects on the southeast coastal environment are reviewed along with some recent improvements in planning. Heavily populated coastal areas without waste water treatment systems as well as areas with overloaded waste treatment systems are cited as examples of inadequate planning. Recent developments in support of more effective planning include the Federal Coastal Zone Management Act, the Federal Water Pollution Control Act Amendments of 1972, and individual actions by states such as the North Carolina Coastal Area Management Act. Some form of federal land use planning is also anticipated in the near future. (See also W76-11224) (Kreager-FIRL)
W76-11621

FIRST THE WATER, THEN THE SEWER, THEN LAND USE PLANNING: COASTAL PLANNING IN RETROSPECT AND IN THE NOW,
North Carolina State Planning Div., Raleigh.
J. R. Hinkley.
In: Proceedings of the Southeastern Conference on Water Supply and Wastewater in Coastal Areas, April 2-4, 1975, Wilmington, North Carolina, University of North Carolina, p 139-147.

Descriptors: *Planning, *Land use, *Coasts, *North Carolina, *Water supply, *Waste water treatment, Treatment facilities, Legislation, Industrial wastes, Domestic wastes.

Inadequacies in land use planning along the southeastern coastal area are discussed in relation to water supply and waste treatment problems. A review of residential and industrial strip development along the North Carolina coast reveals that water supply and waste water treatment facilities which were originally designed for limited services are now being overloaded by additional coastal-rural strip developments. Legislation passed by the state's general assembly to insure better land use planning in the future includes the Coastal Area Management Act and the State Land Policy Act. A Coastal Resources Commission and Coastal Resources Advisory Council have been activated to guide the formulation of land use plans in each of the state's 20 counties and their respective municipalities in the coastal area. (See also W76-11224) (Kreager-FIRL)
W76-11622

IMPACT OF WATER SUPPLY AND WASTEWATER ON THE COASTAL AND MARINE ENVIRONMENTS,
North Carolina State Univ., Raleigh. Sea Grant Program.
B. J. Copeland.
In: Proceedings of the Southeastern Conference on Water Supply and Wastewater in Coastal Areas, April 2-4, 1975, Wilmington, North Carolina, University of North Carolina, p 178-187.

Descriptors: *Water supply, *Waste water treatment, *Atlantic coastal plain, *Groundwater availability, *Water reuse, Desalination, Septic tanks, Outlets, Oceans, Injection wells, Recycling, Solid wastes, Methane, Byproducts, Planning, Coasts.

Water supply and waste water treatment problems associated with southeastern coastal communities are reviewed along with the need for the development of comprehensive community planning. Potential environmental problems are discussed for the following water supply and waste water treatment alternatives: the pumping of fresh water from groundwater supplies, desalination, waste water reuse, the transport of water from other areas, the use of septic tanks, land disposal, deep-well injection, conventional waste water treatment and the disposal of waste water via ocean outfalls. The recycling of waste water through the water supply system appears to be an optimal choice for solving water problems in the coastal zone. This process also appears capable of eliminating many waste disposal problems. Solids generated by recycling processes might conceivably be used for the generation of methane gas. (See also W76-11224) (Kreager-FIRL)
W76-11625

5E. Ultimate Disposal Of Wastes

HYDRAULIC COLLECTION AND DISPOSAL OF REFUSE,
Meta Systems, Inc., Cambridge, Mass.
For primary bibliographic entry see Field 5D.
W76-11138

A FORCED AERATION SYSTEM FOR COMPOSTING WASTEWATER SLUDGE,
Agricultural Research Service, Beltsville, Md. Biological Waste Management; and Agricultural Research Service, Beltsville, Md. Soil Nitrogen Lab.
E. Epstein, G. B. Willson, W. D. Burge, D. C. Mullen, and N. K. Enkiri.
Journal Water Pollution Control Federation, Vol. 48, No. 4, p 688-694, April, 1976. 8 fig, 5 ref.

Descriptors: *Aeration, *Sludge treatment, *Odor, *Coliforms, *Salmoneall, *Waste water treatment, Microorganisms, Biological treatment, Temperature, Temperature control, Waste water treatment.
Identifiers: Forced aeration, Composting.

Studies investigating the use of forced aeration for composting raw waste water sludge without the release of odors are reported. Suction applied early during composting in a pile insulated with screened compost avoids the release of odorous gases to the atmosphere. Destruction of total coliforms, fecal coliforms, and salmonellae is much greater with the forced aeration method than it is with windrow composting. A survival of microorganisms in the lower corner of the pile is believed to be a result of a lack of insulation of compost depth and the resulting heat loss in this section. Most of the temperatures recorded are in the thermophilic range. Efforts are underway to achieve more uniform temperatures throughout the piles by modifying the suction system. (Kreager-FIRL)
W76-11200

LAND TREATMENT OF MUNICIPAL WASTEWATER,
Metcalf and Eddy, Inc., Palo Alto, Calif.
For primary bibliographic entry see Field 5D.
W76-11207

OCEEDINGS OF THE SOUTHEASTERN
NFERENCE ON WATER SUPPLY AND
ASTEWATER IN COASTAL AREAS,
rth Carolina Water Resources Research Inst., leigh.
r primary bibliographic entry see Field 5D.
6-11224

ATER SUPPLY AND WASTEWATER
SPOSAL - PLANNING AND PROBLEMS - IN
ASTAL AREAS,
sen (Henry von) and Associates, Inc., Wilming-, N. C.
primary bibliographic entry see Field 5D.
6-11225

EAN OUTFALL DISPOSAL SYSTEMS,
ineering-Science, Inc., Berkeley, Calif.
primary bibliographic entry see Field 5D.
5-11226

ND DISPOSAL OF WASTEWATER,
th Carolina State Univ., Raleigh. Dept. of ogical and Agricultural Engineering.
Humenik.
Proceedings of the Southeastern Conference Water Supply and Wastewater in Coastal as. April 2-4, 1975. Wilmington, North olina, University of North Carolina, p 48-59. 3 4 tab.

criptors: *Waste water disposal, *Irrigation, ste water treatment, *Aeration, *Ponds, Mu-al wastes, Industrial wastes, Nitrogen, Heavy ls, Phosphorus, Solid wastes.
tifiers: Hydraulic loading, Land disposal, ess load.

use of land application for the disposal of mu-al and industrial waste water is discussed. inal disposal via land irrigation is limited r by the hydraulic or process load. The higher egree of pretreatment provided or the lower oncentration of nitrogen, the more hydraulic ng predominates as the controlling factor; eas, hydraulic load becomes insignificant dealing with waste water that has a high con-ation of any constituent that affects the plant-eceiver system. Aerated ponds can provide icant pretreatment at a very low cost. Up to nitrogen removal in pond systems appears ble with minimum horsepower requirements omplete surface agitation. Pond systems are effective for heavy metal removal if the or-waste input is high and the organic metal lex remains in the bottom sludge. It is not al-best to treat waste water to as high a degree ssible before discharge to streams because ased systems can provide a more economi-ternative. The use of land application as a tute for tertiary treatment of nitrogen, horus, metals, and solids appears to be a less expensive method of meeting current tory criteria in most areas. (See also W76-) (Kreager-FIRL)
1227

LOW SUBSURFACE DISPOSAL OF
EWATER,
Carolina Dept. of Natural and Economic rces. Div. of Environmental Management.
Turnage, Jr.
oceedings of the Southeastern Conference ater Supply and Wastewater in Coastal April 2-4, 1975, Wilmington, North na, University of North Carolina, p 60-67.

ptors: *Waste water disposal, *Coasts, isposal fields, *Septic tanks, *Waste water ent, *Subsurface flow, Nitrification, al, Treatment, Coliforms, Viruses, Design . Regulation.

The use of shallow subsurface systems for the disposal of waste water in coastal areas is discussed. Septic tank-nitrification line systems appear to be suitable for low-density coastal areas where the proper soil structure exists and where adequate separation from surface waters and groundwaters can be maintained. Particular attention must be paid to the possible presence of a compacted muck or vegetative layer underlying sand fills because of the likelihood of an impervious interface, resulting in the horizontal movement of effluent. Indiscriminate and unwise development where septic tank systems are used poses a potentially serious danger of contaminating the adjacent waters with fecal coliform and viruses. The introduction of treated waste water to the soil subsurface is another method of shallow disposal in coastal areas, though this method is considered mainly as an interim solution to waste disposal, pending the development of regional sewage collection and treatment systems with ocean outfalls. Regulations and design criteria for shallow subsurface systems established by the North Carolina Environmental Management Commission are outlined. (See also W76-11224) (Kreager-FIRL)
W76-11228

SUMMARY: TECHNOLOGICAL ALTERNATIVES FOR WATER SUPPLY AND WASTEWATER DISPOSAL IN THE COASTAL AREA,
Clemson Univ. S. C. Dept. of Civil Engineering.
B. L. Edge.
In: Proceedings of the Southeastern Conference on Water Supply and Wastewater in Coastal Areas. April 2-4, 1975, Wilmington, North Carolina, University of North Carolina, p 124-132.

Descriptors: *Waste water disposal, *Waste water treatment, *Coasts, *Oceans, Recycling, Septic tanks, Injection wells, Aquifers, Ecosystems, Chemical reactions, Water pollution effects, Technology.

Technological alternatives for waste water disposal in coastal areas are reviewed. Recycling appears to be attractive for the disposal of most wastes in coastal areas, though ocean disposal techniques that cause minimal damage to the ecosystem may be necessary for some types of wastes. Evidence indicating that life in the oceans has diminished by as much as 50% in the last 20 years, however, argues against the indiscriminate use of ocean outfalls. Subsurface waste disposal using septic tanks is considered generally unfeasible for coastal areas, particularly high-priced ocean front areas. Deep well disposal is another alternative for waste disposal in coastal areas; however, more information is required to assess the effect of high pressures and long residence times on the possible production of hazardous compounds from wastes injected into deep wells. The possible emergence of aquifers into the ocean must also be considered in terms of disrupting the ecosystem. (See also W76-11224) (Kreager-FIRL)
W76-11230

LAND APPLICATION OF WASTEWATER.
Environmental Protection Agency, Philadelphia, Pa. Region III.
For primary bibliographic entry see Field 5D.
W76-11231

LAND APPLICATION RESEARCH AT ROBERT S. KERR ENVIRONMENTAL RESEARCH LABORATORY,
Robert S. Kerr Environmental Research Laboratory, Ada, Okla.
For primary bibliographic entry see Field 5D.
W76-11232

LAND APPLICATION PRACTICES AND DESIGN CRITERIA,
Metcalf and Eddy, Inc., Palo Alto, Calif.
For primary bibliographic entry see Field 5D.
W76-11233

EXPERIENCES AT PENN STATE WITH LAND APPLICATION,
Pennsylvania State Univ., University Park. School of Forest Resources.
For primary bibliographic entry see Field 5D.
W76-11234

OVERLAND FLOW TREATMENT OF WASTEWATER - A FEASIBLE APPROACH,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Environmental Effects Lab.
For primary bibliographic entry see Field 5D.
W76-11235

INFILTRATION-PERCOLATION SYSTEMS,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
For primary bibliographic entry see Field 5D.
W76-11236

LAND APPLICATION OF TREATED SEWAGE IN THE MOUNTAIN STATE.
Campaign Clean Water, Charleston, W.Va.
For primary bibliographic entry see Field 5D.
W76-11237

THE TREATMENT OF WATER PURIFICATION PLANT WASTES,
Gore and Storrie Ltd., Toronto (Ontario).
For primary bibliographic entry see Field 5F
W76-11256

SYMBIOSIS MAKES COMPLETE WATER REUSE PRACTICAL,
For primary bibliographic entry see Field 5D.
W76-11258

WASTEWATER RECYCLE - THE PROPER APPROACH TO EVALUATION OF DISPOSAL VERSUS REUSE,
Ecodyne Corp., Union, N. J. Industrial Waste Treatment Div.
For primary bibliographic entry see Field 5D.
W76-11263

HOW TO DISPOSE OF TOXIC SUBSTANCES AND INDUSTRIAL WASTES,
Noyes Data Corporation, Park Ridge, N.J.
P. W. Powers.
Noyes Data Corporation, Park Ridge, New Jersey and London, England, Environmental Technology Handbook No. 4, 1976, 497 p.

Descriptors: *Industrial wastes, *Waste disposal, *Toxicity, *Reviews, Wastes, Water pollution sources, Chemical wastes, Radioactive waste disposal, Explosives, Pulp and paper industry, Wood wastes, Landfills, Oceans, Deep wells, Incineration, Biological treatment, Chemical degradation, Ultimate disposal, Sulfite liquors, Organizations, Pulp wastes, Bibliographies, Publications, Patents.
Identifiers: Flammable wastes, Printing industry, Black liquors.

This review of pertinent government reports, journal articles, U.S. patents, and other literature sources deals in detail with the ultimate disposal of toxic chemical, biological, radioactive, flammable, and explosive wastes from various industrial and other sources (including the graphic arts, wood, and pulp and paper industries). The topics are organized according to both origin (nature) of materials and method of disposal (land burial, landfill, ocean discharge, deep wells, incineration, biological and chemical degradation, and pretreatments for ultimate disposal). Among paper-industry wastes discussed are black liquors, spent

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sulfite liquors, and pulping process vapors. A list of private waste-handling contractors and service organizations in the U.S.A. is appended. (Brown-IPC)
W76-11368

LAND TREATMENT AND DISPOSAL OF MUNICIPAL AND INDUSTRIAL WASTEWATER,
Montana State Univ., Bozeman. Dept. of Civil Engineering and Engineering Mechanics.
For primary bibliographic entry see Field 5D.
W76-11370

AN EXPERIMENTAL HIGH-ASH PAPER MILL SLUDGE LANDFILL,
Michigan State Univ., East Lansing.
O. B. Andersland.
In: TAPPI Environmental Conference, Atlanta, Georgia, April 26-28, 1976, Preprinted Proceedings (TAPPI, Atlanta, Georgia), p 171-186. 17 fig, 15 ref.

Descriptors: *Sludge disposal, *Landfills, *Pulp wastes, Ultimate disposal, Wastes, Industrial wastes, Water pollution sources, Solid wastes, Sludge, Organic wastes, Consolidation, Soil mechanics, Soil stabilization, Waste disposal, Land forming, Shear strength, Settlement(Structural), Tile drains, Subsurface drains, Leachate, Groundwater, Mechanical engineering.

An experimental landfill for paper mill sludge rich in ash (mineral elements) was constructed and monitored to obtain engineering data essential for development of guidelines and recommendations for the design and operation of future landfills for solid paper mill wastes. Construction of the landfill is described, and physical properties of the sludge are summarized. Consolidation and settlement during the first year and movements within an excavated slope during the second year were closely monitored. The field behavior of the sludge during consolidation and after slope excavation was analyzed, using theories from geotechnical engineering. The primary compression of the sludge was very rapid, suggesting that preloading can be an effective way for stabilization and minimizing long-term settlements. Low sludge unit weight plus high stability of the consolidated sludge makes it suitable as a light weight fill material for embankments. The high shear strength of the consolidated sludge suggests that the landfill could be contoured to provide recreational areas, etc. Proper placement of sand or gravel blankets and/or tile drains will shorten the drainage time within the sludge, thereby reducing the time needed for primary consolidation. The drains could also be utilized to collect the leachate for subsequent treatment, to protect groundwater, etc. (Sykes-IPC)
W76-11379

UNOX SECONDARY SLUDGE DEWATERING STUDIES AT LONGVIEW FIBRE COMPANY,
Longview Fibre Co., Wash.
For primary bibliographic entry see Field 5D.
W76-11381

USING PAPER MILL SLUDGE AS CONCRETE ADMIXTURE,
Michigan Technological Univ. Houghton.
B. D. Alkire, and S. M. Newton.
Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, Vol. 101, p 469-473, 1975. 2 fig, 6 ref, 1 tab.

Descriptors: *Sludge, *Pulp wastes, *Concrete additives, Wastes, Industrial wastes, Water pollution sources, Pulp and paper industry, Sludge disposal, Water pollution control, Compressive strength, Concretes, Portland cements, Michigan, Ultimate disposal, Waste disposal, Recycling.
Identifiers: Groundwood mills, Kraft mills.

As an initial investigation into the effect of a pulp and paper mill sludge on the compressive strength of concrete, a series of tests were conducted on concrete mortar cubes prepared with four different amounts of sludge, three water/cement ratios and ffour curing times. The sludge used as the additive was obtained from an integrated groundwood/kraft pulp and paper mill in Upper Michigan. The sludge was dried and ground until it passed a No. 100 standard sieve. The addition of 0.5% dried paper mill sludge to portland cement did not reduce the compressive strength of the concrete, but additions of 1 and 1.5% reduced the strength up to 20%. (Buchanan-IPC)
W76-11399

FLOCCULATION PROCESS,
Mobil Oil Corp., New York. (Assignee).
For primary bibliographic entry see Field 5D.
W76-11451

APPARATUS FOR DISPOSING OF ORGANIC WASTE MATERIALS,
L. E. Streebin, and N. A. Nassef.
U.S. Patent No. 3,956,126, 6 p, 4 fig, 12 ref; Official Gazette of the United States Patent Office, Vol 946, No 2, p 731, May 11, 1976.

Descriptors: *Patents, *Domestic wastes, *Industrial wastes, *Organic wastes, *Water pollution sources, *Waste disposal, Evaporation, Heat exchangers, Incineration, Condensation, Water reuse, Equipment.
Identifiers: Combustion, Internal combustion engine.

The invention provides an apparatus or system for efficiently disposing of organic waste materials, including sewage and garbage. The waste material is directed to an evaporator where the liquid content of the waste material is evaporated by the use of a suitable heat exchange medium. The heat exchange medium is heated by exhaust gases from an internal combustion engine, and also by the heat of combustion developed by burning in the hot exhaust gases from the engine, substantially all of the solid residue remaining in the evaporator after the water has been removed. The liquid from the evaporator is recondensed and can be recycled for re-utilization or can be discharged if desired. The products of combustion constitute a small amount of ash and carbon dioxide and can be discharged to the atmosphere from the exhaust pipe of the engine. (Sinha-OEIS)
W76-11455

MODELING THE FATES OF METALS IN OCEAN-DISCHARGED WASTEWATERS,
Southern California Coastal Water Research Project, El Segundo.
For primary bibliographic entry see Field 5B.
W76-11464

ENVIRONMENTAL PROTECTION AGENCY'S ROLE, INTERESTS, AND RESPONSIBILITIES WITH RESPECT TO THE OUTER CONTINENTAL SHELF DEVELOPMENT,
Environmental Protection Agency, Johns Island, S. C. Office of Research and Development.
For primary bibliographic entry see Field 6G.
W76-11479

STUDIES ON THE IMPROVEMENT EFFECT OF WASTE LIQUOR FROM PULP MILLS FOR THE SOILS: I. THE VEGETATION EXPERIMENTS WITH SOYBEANS AND CORN, (IN JAPANESE),
Shimane Univ., Matsue (Japan). Faculty of Agriculture.
N. Koshiba.
Bull Fac Agric Shimane Univ. 7, p 135-139, 1973.

Descriptors: *Soybeans, *Corn(Field), Vegetation, Pulp wastes, Soils, Waste disposal, *Application rates, Water reuse.
Identifiers: *Waste liquor.

Best results were obtained when waste liquor w applied to the soil 1-2 wk before seeding. a lat application delayed germination The waste liqu was especially effective for volcanic soil and loa soil. The waste liquor has the same or better so improving effect than compost. The optimum a plication rate was about 500 kg/10 acres.--Cop right 1975, Biological Abstracts, Inc.
W76-11563

YIELD AND HEAVY METAL CONTENT O FOOD CROPS GROWN ON SOILS AMENDE WITH SEWAGE SLUDGE,
California Univ., Riverside.
For primary bibliographic entry see Field 5D.
W76-11610

ENVIRONMENTAL ASSESSMENT OF MARI OUTFALLS,
Environmental Protection Agency, Atlanta, G Region IV.
D. R. Hopkins.
In: Proceedings of the Southeastern Confere on Water Supply and Wastewater in Coa Areas, April 2-4, 1975, Wilmington, No Carolina, University of North Carolina, p 27-34

Descriptors: *Waste water disposal, *Outf *Permits, *Legislation, *Oceans, *Coa *Florida, Atlantic coastal plain, Effluents, Wa water treatment, Legal aspects, Evaluation.
Identifiers: Federal Water Pollution Control Amendments.

Federal criteria for the issuance of ocean dispo permits for waste outfalls are reviewed along w Environmental Protection Agency studies of potential impact of ocean outfalls in south Florida. The Federal Water Pollution Control Amendments of 1972 establish criteria for the suance of permits for ocean discharges based the following considerations: the environme effects of the proposed waste disposal operat the need for ocean disposal, alternatives to oc disposal, and the effect of the proposed actio aesthetic, recreational, economic, and o values associated with the ocean. The criteria with the evaluation of individual permit appl tions on a case-by-case basis from informa supplied by the applicant concerning the cha teristics of the waste and the effect of the w water on the receiving environment. An Envi mental Protection Agency study of alterna waste water disposal methods in southeast Flo concludes that disposal of secondary treated w water to the ocean via outfalls is a viable me of disposal for the area. (See also W76-11 (Kreager-FIRL)
W76-11615

MANAGEMENT AND FINANCING ALTER TIVES FOR WASTE DISPOSAL IN COAS AREAS,
North Carolina Univ. at Chapel Hill. Inst Government.
W. J. Wicker.
In: Proceedings of the Southeastern Confer on Water Supply and Wastewater in Co Areas, April 2-4, 1975, Wilmington, N Carolina, University of North Carolina, p 35- ref.

Descriptors: *Coasts, *Waste water disp *Financing, *Management, Waste disposal, jurisdiction, State governments, Local go ments, Effluents.

Alternatives for the management and financi waste disposal in coastal areas are discussed traditional approach to the financing and ma

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lt of coastal area waste disposal which involves acceptance of local responsibility by cities and ns appears unlikely to meet present and future ds in many cases, and joint action by county local governments appears to be needed along direct state participation in some cases. One ed possibility involves state financing and local agement, with the state prescribing the stan- ls for the entire management structure of the te disposal operations. Another possibility in- es the establishment of separate boards which esent local and state agencies and operate er general state supervision. (See also W76- 4) (Kreager-FIRL)
-11616

P WELL DISPOSAL OF WASTEWATER,
ronmental Protection Agency, Atlanta, Ga.
on IV.
Crooks, and C. W. Sever.
Proceedings of the Southeastern Conference Water Supply and Wastewater in Coastal s, April 2-4, 1975, Wilmington, North lina, University of North Carolina, p 68-74. 3

riptors: *Waste water disposal, *Coasts, er reuse, *Deep wells, *Injection wells, ifers, Water distribution(Applied), Water gement(Applied), Water conservation, es, Bacteria, Waste water treatment, lation, Regulation.
ifiers: Safe Drinking Water Act.

se of deep-well injection for the disposal of water and the preservation of usable dwater supplies is discussed. The use of injection wells for the storage of treated water in salt water aquifers can in some provide a twofold benefit: potentially harm- ruses and bacteria that might survive secon- treatment are removed from man's environ- and the injected fresh waste water displaces er quality (salty) groundwater, thus creating reserve of usable water in underground e. Along many coastal areas in particular, eavy withdrawal of potable groundwater resh-water aquifers is causing salt water en- nment inland into the aquifer system; and, in cases, treated waste water may be injected e aquifer system to create a hydraulic barri- hold back the encroaching salt water. Regu- s of the Safe Drinking Water Act which deal e protection of groundwater from the injec- f wastes into the ground are reviewed along nvironmental Protection Agency policies on reuse. (See also W76-11224) (Kreager-FIRL)
1617

OMIC IMPLICATIONS OF COASTAL E DISPOSAL ALTERNATIVES,
a Univ., Athens. Inst. of Natural rces.
North.
oceedings of the Southeastern Conference ater Supply and Wastewater in Coastal April 2-4, 1975, Wilmington, North a, University of North Carolina, p 148-159. ref.

tors: *Waste water treatment, *Coasts, omics, *Economic efficiency, *Cost analy- st allocation, Estuaries, Dissolved oxygen, ation, Treatment facilities, Administra- ater quality control.

nomics of alternative waste water disposal s for coastal areas are evaluated. Economic ives are assessed in terms of the degree of uality desired, the type of institutional ar- ents required, and the method of paying for water quality level. Estimated costs of al- e waste treatment systems for the re and Potomac Estuaries are calculated eal that in each case simple instream reox- n can be used to achieve a given level of dissolved oxygen at a cost substantially less than that required for uniform conventional waste water treatment. Failure to implement least cost solutions to waste problems appears to often result from a lack of institutional flexibility and a misal- location of resources. (See also W76-11224) (Kreager-FIRL)
W76-11623

5F. Water Treatment and Quality Alteration

DEBATE GROWS OVER WATER PURIFICATION METHODS.
Chemical and Engineering News, Vol. 54, No. 26, p 34, 39, June 21, 1976.

Descriptors: *Waste water treatment, *Treatment facilities, *Water purification, *Disinfection, Viruses, Coliforms, Chlorination, Water quality standards, Ozone.

Criteria for achieving disinfection of water and waste water were discussed at a forum sponsored by the International Ozone Institute. Waste water disinfection has been defined as the reduction of virus and fecal coliform bacteria concentrations to acceptable levels. In the United States, chlorination of waste water is the predominant treatment method, and laws require chlorine residuals in treated waters. An amendment, proposed in August 1975, would delete coliform bacteria limitations and instead require EPA to determine disinfection according to water quality standards. An important chlorine alternative is ozonation. Possibilities for converting chlorination treatment facilities are discussed. In the United States, an ozone treatment project has been operating since 1971 at Blue Plains, near Washington, D.C. Estes Park, Colorado and Cleveland, Ohio, have also adopted ozonation. (Kramer-FIRL)
W76-11205

BIN ACTIVATORS RELIABLY FEED LIME AND DIATOMACEOUS EARTH IN WATER TREATMENT FACILITY.
Pollution Engineering, Vol. 8, No. 6, p 14, 18, June, 1976. 1 fig.

Descriptors: *Treatment facilities, *Water treatment, *Lime, *Diatomaceous earth, *Automation, Sludge disposal, Sludge, Mechanical equipment.
Identifiers: *Bin activators.

An automated system to feed diatomaceous earth and pebble lime assures that a filter washwater and alum sludge disposal facility installed by Passaic Valley Water Commission (PVWC) at their Little Falls Water Treatment Plant in Totowa, New Jersey, will operate successfully. The new plant eliminates the discharge of 20 tons of sludge a day into the Passaic River and enables PVWC to meet the 1985 Federal zero discharge requirements. The new facility, which utilizes sludge presses, requires uninterrupted flow of diatomaceous earth and lime to the dewatering system from storage bins. Approximately 6500 and 1100 lb of pebble lime and diatomaceous earth, respectively, are fed to the system daily. To eliminate possible flow problems, four Vibra Screw Bin Activators were installed on the storage bins. Lime is discharged to slakers, at the rate of 1000 lb/hr, through 8-in. diameter discharge outlets on three of the activators. The other Bin Activator discharges 400 cu ft/hr of diatomaceous earth to a heavy duty feeder. The Bin Activator is vibrated and replaces a static bin bottom, removing the compaction area where flow problems originate. The feeder is a rugged volumetric screw feeder whose trough and feed screw vibrate. Vibration of the trough maintains uniform density and insures complete filling and emptying of each of the screw's flights. Feeder output is determined by screw speed and is controllable to better than 1% accuracy. (Snyder-FIRL)
W76-11208

PROCEEDINGS OF THE ANNUAL CONFERENCE, ONTARIO SECTION, AMERICAN WATER WORKS ASSOCIATION; POLLUTION CONTROL ASSOCIATION OF ONTARIO; AND ONTARIO MUNICIPAL WATER ASSOCIATION.
Held April 20-23, 1974, at Toronto, Ontario, Canada. Published in Ottawa, 1976, 429 p.

Descriptors: *Water treatment, *Water purification, *Canada, *Water supply, *Disinfection, *Potable water, Chlorination, Water works, Treatment facilities, Monitoring, Waste water treatment, Water pollution control, Pollution abatement, Waste disposal.

Papers selected from this Conference include: Disinfection, Dechlorination and Toxicity to Fish, by James A. Servizi and Dennis W. Martens; Viral Contamination of the Water Environment, An Underestimated Problem, by Dr. M. S. Mahdy; Commuter-Aided Planning of a Regional Disposal System for Municipal Sludge, by F. J. Allan, P. L. Silveston, W. C. Keay and E. R. Simonen; Urban Drainage: Problems and Possibilities, by Don. H. Waller: Environmental Assessment - A Planning Tool, by Mel Plewes; The Great Lakes Agreement - A Mid-Term Perspective, by Raymond M. Robinson; Contemporary Chlorine Disinfection Practices in Ontario, by Charles J. H. Kretch; Automated Fluoridation Using a Selective Ion Electrode, by Wayne Manley; Pre-Treatment of Water Supplies Utilizing Ferric Chloride, by John A. Carnduff; A New Concept in Small Water Systems, by George Aldworth; Maintenance Management of Waterworks Systems, by James L. Smith; Construction Safety in Waterworks, by Charles E. McKnight; Safety in Water and Wastewater Plants, by Ray Norton; Metropolitan Toronto's Approach to Preventive Maintenance for Treatment Plants, by Earl Baldock; Operator Training and Certification in Canada, by Alex Redekopp; Training and Certification: Ontario Ministry of Environment, by Robert R. Doddridge; Northern Environmental Engineering - A Canadian Challenge, by R. N. Dawson and J. W. Slupsky; and Treatment of Water Purification Plant Wastes, by R. A. G. Simmons and A. J. Bowers. (See also W76-11250 thru W76-11256)
W76-11249

CONTEMPORARY CHLORINE DISINFECTION PRACTICES IN ONTARIO,
Knox Martin Kretch Ltd., Bramalea (Ontario).
C. J. H. Kretch.
In: Annual Conference Proceedings of the Ontario Section of the American Water Works Association, Pollution Control Association of Ontario, and Ontario Municipal Water Association, April 20-23, 1975, Toronto, Ontario, p 179-198. 2 fig, 6 ref.

Descriptors: *Disinfection, *Potable water, *Chlorination, *Water purification, Water treatment, Treatment facilities, Groundwater, Surface waters, Water supply.
Identifiers: Free residual chlorination, *Dechlorination, Ammoniation, Chloramination.

Methods for the disinfection of potable water supply sources obtained from both surface and subsurface supplies are discussed, with particular emphasis on chlorine disinfection practices in Ontario, Canada. The following disinfection practices are reviewed: plain chlorination, free residual chlorination, free residual chlorination followed by dechlorination, and chloramination. In general, only plain chlorination is employed for disinfection of potable water supplies throughout Ontario, although Toronto is using free residual chlorination followed by dechlorination at its older plants and free residual chlorination and dechlorination followed by ammoniation at recently constructed facilities. Recently, a trend has been initiated for the adoption of compulsory free residual chlorination at all installations throughout Ontario. (See also W76-11249) (Kreager-FIRL)
W76-11250

AUTOMATED FLUORIDATION USING A SELECTIVE ION ELECTRODE,
Peterborough Utilities Commission, Peterborough, Ontario, Canada, Filtration Plant.
W. Manley.
In: Annual Conference Proceedings of the Ontario Section of the American Water Works Association, Pollution Control Association of Ontario, and Ontario Municipal Water Association, April 20-23, 1975, Toronto, Ontario, p 200-209, 2 fig, 5 ref.

Descriptors: *Fluoridation, *Potable water, *Analytical techniques, *Monitoring, *Fluorides, *Electrodes, Automatic control, Equipment, Automation, Water treatment, Pumps, Treatment facilities, Pollutant identification.
Identifiers: *Selective ion electrodes.

The use of selective ion electrode systems for monitoring fluoride ion concentrations and controlling the fluoride residual in drinking water supplies is discussed. Unlike colorimetric methods of fluoride measurement, very few physical or chemical interferences occur with the fluoride selective ion electrode. There is no need to dechlorinate or remove the turbidity or color from the sample being measured, and no time-consuming distillation is required. Hydroxide interference can be eliminated by the use of total ionic strength buffers which also provide a high ionic strength background, thereby swamping out variations in sample ionic strength. A continuous analysis and control system for maintaining the proper fluoride residual is outlined. The system utilizes a selective ion electrode in combination with a duplex pump whose stroke length varies in accordance with signals received from the analyzer so that the desired fluoride residual is maintained. (See also W76-11249) (Kreager-FIRL)
W76-11251

PRE-TREATMENT OF WATER SUPPLIES UTILIZING FERRIC CHLORIDE,
Westerly Filtration Plant, Toronto (Ontario). Quality Control Office.
J. A. Carnduff.
In: Annual Conference Proceedings of the Ontario Section of the American Water Works Association, Pollution Control Association of Ontario, and Ontario Municipal Water Association, April 20-23, 1975, Toronto, Ontario, p 211-227. 9 tab, 7 ref.

Descriptors: *Coagulation, *Water purification, *Iron compounds, *On-site investigations, Feasibility studies, Chemical reactions, *Water treatment, Performance, Evaluation, Costs, Economics, *Pre-treatment(Water).
Identifiers: Ferric chloride, Alum, Aluminum sulfate, Coagulants.

Laboratory, pilot plant, and field tests were conducted to determine the feasibility of using ferric chloride as a substitute coagulant for alum during water treatment operations. The chemical reactions of coagulation in which iron salts react with water to form floc are similar to those of aluminum sulfate, with the main reaction in both instances being between the metal salt and the natural alkalinity in the water to produce complex hydrous oxide compounds. Pilot plant studies established that ferric chloride can be applied in dosages up to 10 ppm in high rate filters operating at rates up to 4 grams/min/sq ft. Tests at a water treatment plant using 1 ppm of ferric chloride showed satisfactory results; increasing the dosage up to 6 ppm only decreased the filter run length while maintaining the same quality of filtered water. The iron in the filtrate was usually less than 0.015 ppm, with only one run exceeding 0.050 ppm. The dosage of ferric chloride required to produce results comparable to those obtained with alum was generally half that for alum addition. A comparison of the costs of ferric chloride versus alum reveals that significant savings can be realized by using ferric chloride as a substitute coagulant. (See also W76-11249) (Kreager-FIRL)
W76-11252

A NEW CONCEPT IN SMALL WATER SYSTEMS,
MacLaren (James F.) Ltd., Toronto (Ontario).
For primary bibliographic entry see Field 5D.
W76-11253

MAINTENANCE MANAGEMENT OF WATER-WORKS SYSTEM,
Thorne Riddell Associates Ltd., Toronto (Ontario).
J. L. Smith.
In: Annual Conference Proceedings of the Ontario Section of the American Water Works Association, Pollution Control Association of Ontario, and Ontario Municipal Water Association, April 20-23, 1975, Toronto, Ontario, p 249-253. 1 fig.

Descriptors: *Water treatment, *Water works, *Maintenance, *Planning, *Budgeting, *Management, *Treatment facilities, Repairing, Maintenance costs, Equipment, Costs.

A system of maintenance management for water works is outlined. The system is designed so that a budget developed will be based not solely on historical data but also on the requirements and capabilities as provided by the level of service and productivity. Basic information required before a work plan and budget can be achieved includes: an inventory of the facilities to be maintained, desired performance standards, the required level of service, and reporting procedures for establishing productivity standards. Financial data can then be added to the above information to develop unit costs (for example, cost per mile of pipe repaired). Benefits gained by establishing a maintenance management program for water works include: the provision of a standard level of service to all people being served by the system, the establishment of an annual work schedule to take into account predicted peaks and lows in work load, and the avoidance of duplication by planning and allocating work in advance. (See also W76-11249) (Kreager-FIRL)
W76-11254

METROPOLITAN TORONTO'S APPROACH TO PREVENTATIVE MAINTENANCE FOR TREATMENT PLANTS,
Metropolitan Toronto Dept. of Works, (Ontario). Water and Pollution Control Directorate.
E. H. Baldock.
In: Annual Conference Proceedings of the Ontario Section of the American Water Works Association, Pollution Control Association of Ontario, and Ontario Municipal Water Association, April 20-23, 1975, Toronto, Ontario, p 332-346. 8 fig, 1 tab.

Descriptors: *Maintenance, *Treatment facilities, *Water treatment, *Computer programs, Equipment, Repairing, Instrumentation, Canada, Costs.
Identifiers: Inventories, Toronto.

A pilot-scale, computerized equipment maintenance and inventory system being used at water treatment plants in metropolitan Toronto is described. Each piece of equipment being maintained is numbered so that data on its condition can be stored in a computer. The data stored include a cost inventory of all units, a preventative maintenance schedule of all components of the equipment, and a history of the maintenance work which includes the man hours of work performed. The maintenance cycle is a function of the operating hours of each piece of equipment, and this information is fed into the computer on a regular basis. The computer prints out on a weekly basis a list of components to be serviced that week. Upon completion of the task, the workman then records the updated condition of the repaired equipment. Formats used for recording the above data are illustrated. (See also W76-11249) (Kreager-FIRL)
W76-11255

THE TREATMENT OF WATER PURIFICATION PLANT WASTES,
Gore and Storrie Ltd., Toronto (Ontario).
R. A. G. Simmons, and A. J. Bowers.
In: Annual Conference Proceedings of the Ontario Section of the American Water Works Association, Pollution Control Association of Ontario, and Ontario Municipal Water Association, April 20-23, 1975, Toronto, Ontario, p 404-429. 6 fig, 1 tab, ref.

Descriptors: *Water purification, *Waste treatment, *Waste disposal, *Cost analysis, *Land use, Landfills, Sewerage, Filtration, Freezing, Lagoons, Drying, Byproducts, Recycling, Centrifugation.
Identifiers: Water treatment wastes

Various methods for the treatment and disposal of water purification plant wastes are reviewed. Topics covered include: waste reduction by reducing water usage or implementing process changes; waste collection and centralization; and treatment and disposal options such as barging to sea, lagooning, sand bed drying, discharge to sanitary sewers, freezing, vacuum filtration, centrifugation, filter pressing, and coagulant recovery. Pressure filtration, lagooning, and disposal to sewers systems are cited as the most probable solutions to waste problems resulting from water purification activities. Alternative final disposal sites are also discussed and include: sanitary landfill sites, specially selected non-agricultural sites, and agricultural land. A cost analysis of alternative waste treatment and disposal processes is presented. (See also W76-11249) (Kreager-FIRL)
W76-11256

AUTOMATED POND WATER TREATMENT UNIT,
Oklahoma State Univ., Stillwater. Dept. of Agricultural Engineering.
C. E. Rice, J. E. Garton, and L. Jarrell.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-256 [illegible], $3.50 in paper copy, $3.00 in microfiche. Completion Report, (1976). 16 p, 7 fig, 1 tab, 1 ref. OWRT A-060-OKLA(1).

Descriptors: *Water treatment, Ponds, *Filtration, *Pumps, Storage tanks, Waste water treatment, *Pumping, Chlorine.
Identifiers: Rural water supply, Upflow filtration, *Sand filters, Backflushing, Alum.

An automated pond water treatment unit was designed, constructed and evaluated. It was designed as an exterior unit to be located in the vicinity of a pond or lake. The unit was self-contained and furnished filtered and chlorinated water under pressure. The unit consisted of a pond water pump, chlorine and alum solution containers with metering pumps, a sand filter, a time clock and solenoid for backflushing, storage for treated water and a water pressure pump and storage tank. The sand filter was an upflow type which permitted the floc to settle out and be removed by backflushing. The pond water pump had a capacity of nine gallons per minute (34 liters per minute) and the pressure pump a capacity of about [illegible] gallons per minute (30 liters per minute). The unit was located at Hams' Lake, a flood detention reservoir that usually had fairly clear water. Tests with the units showed that it was not filtering water properly so modifications were made. At first the solenoid value restricted the backflush flow too much so it was removed and a gate valve installed for manual operation. Additional tests suggested other minor changes. After these modifications and changes, the unit produced a good quality water.
W76-11340

HYPOLIMNION OXYGENATION,
Union Carbide Corp., New York. (Assignee).
For primary bibliographic entry see Field 5G.
W76-11454

DERDRAIN FOR WATER FILTRATION STEM,
Ran Ltd., Charlotte, N. C. (Assignee).
. Sturgill.
S. Patent No. 3,956,134, 9 p, 15 fig, 11 ref; Offi- Gazette of the United States Patent Office, 946, No 2, p 733-734, May 11, 1976.

criptors: *Patents, *Water treatment, *Waste er treatment, *Water purification, *Water lity, Filtration, Filters, Equipment, Nozzles, ins.
ntifiers: Filtration systems, Filter media, kwashing.

er-filtration systems of the gravity type are loyed for filtering high volumetric flow rates quids in municipal and industrial water treat- t and waste treatment plants. The filtration em comprises one or more filters, each em- ing a bed of finely-divided granular filter ia for filtering a liquid as it seeps downward ugh the filter bed. After a number of hours of ation, it becomes necessary to wash the bed of media in order to remove the material ed. Washing is accomplished by pumping r under pressure through the conduit in rse direction into the system of fluid ageways in the underdrain system, and then rd through the perforations in the underdrain into the overlying bed of filter media. The washing operation must be performed care- to avoid disturbing or damaging the bed by ing channels or 'blow holes'. The object of nvention is to overcome the problem of form- low holes during backwashing and to improve istribution of wash water to insure effectively ing all areas for shorter periods of time. Each rdrain unit is provided with nozzles in the r wall. The cooperating nozzles in each group o oriented so as to direct streams of wash into impingement with each other outside lter underdrain unit to disperse the streams of water and reduce its velocity. (Sinha - OEIS) 11458

ENIC EVALUATION OF IONIC COMPOSI- OF AN IMITATION OF DESALINATED WATER, (IN RUSSIAN)
hno-Issledovatelskii Institut Gigieny, ow (USSR).
rimary bibliographic entry see Field 5C. 1529

OVAL OF HYDROGEN SULFIDE FROM KING AND INDUSTRIAL WATER, (IN IAN),
yuznyi Nauchno-Issledovatelskii Institut nabzheniya, Kanalizatsii, Gidrotekh- kikh Sooruzhenii i Inzhenernoi geologii, Moscow (USSR).
Ass, O. S. Bakharevskaya, V. A. Klyachko, Lazareva, and O. L. Leventon.
nit. 38(8), p 87-88, 1973.

ptors: Hydrogen sulfide, Potable water, In- l water, Oxidation, Bacteria, Water treat- Waste water treatment, Artesian wells.
iers: *Thiobacillus-Thioparus.

erimental device is described for removing om water which consisted of a 350-l vessel diameter of 0.67 m and height of 1 m which led with a 0.5-m-high layer of rubble. The from an artesian well passed through a et pump for enrichment with atmospheric was delivered to the rubble through a 12- meter perforated pipe with four 3-mm- r holes spaced 16.5 mm apart which was the bottom of the vessel. Between 90 and the H2S was removed from the water dur- 30-60 min stay of the water in the device air delivery rate of 3-5 m3/m3 of water. esence of a large number of Thiobacillus is in the biofilm of the device indicated idation of H2S occurred biologically.-- ht 1975, Biological Abstracts, Inc.

W76-11541

STUDY OF THE EFFECT OF WATER DESALINATED BY ELECTRODIALYSIS ON SOME BIOLOGICAL OBJECTS, (IN RUSSIAN),
Nauchno-Issledovatelskii Institut Selskoi Gigieny, Saratov (Gigieny).
For primary bibliographic entry see Field 5D.
W76-11548

CERTAIN ASPECTS OF THE PROCESS OF ENTEROVIRUS INACTIVATION WITH CHLORINE, (IN RUSSIAN),
Institute of General and Municipal Hygiene, Moscow (USSR)
E. L. Lovtsevich.
Gig Sanit 38(10), p 11-15, 1973.

Descriptors: *Chlorine, *Chlorination, *Viruses, Enteric bacteria, Water treatment, Water pollution.
Identifiers: *Enterovirus, *Poliovirus.

An experimental study of poliovirus inactivation during water chlorination showed that C1-inactivated virus could not be reactivated. The amount of residual C1-present in water of water pipe did not inactivate virus introduced into water as a result of secondary contamination. The process of virus inactivation with C1- did not depend exponentially on the time of C1-action. The part of the virus population (0.5-1%) that was more resistant to C1-, was not genetically different from the main part of the virus population; it did not consist of biologically active RNA and probably was formed by aggregations of virus particles.--Copyright Biological Abstracts, Inc. 1976.
W76-11568

REVIEW OF STANDARDS AND OTHER INFORMATION ON THERMOPLASTIC PIPING IN RESIDENTIAL PLUMBING,
National Bureau of Standards. Washington, D. C.
For primary bibliographic entry see Field 8G.
W76-11603

GROUNDWATER SUPPLIES OF THE COASTAL REGION,
H. E. LeGrand.
In: Proceedings of the Southeastern Conference on Water Supply and Wastewater in Coastal Areas, April 2-4, Wilmington, North Carolina, University of North Carolina, p87-101. 3 fig,16 ref.

Descriptors: *Water supply, *Groundwater resources, *Saline water intrusion, *Aquifers, *Coasts, Water pollution effects, Water mangement(Applied), Wells, Septic tanks.

Problems associated with the quality and availability of groundwater supplies along the east coast are reviewed. Groundwater suitable for domestic water supplies occurs at shallow depths throughout the coastal region, though pollution from septic tanks and other sources of manmade pollution is becoming a serious problem in developed areas. The tertiary limestone aquifer along the east coast is one of the most productive aquifers in the world; however, concentrated pumping in certain areas is causing salt water encroachment of this artesian source. Salt-water encroachment in artesian sand aquifers is not yet a serious problem, but excessive concentrated withdrawal of groundwater from these sources may lead to serious salt water problem in the future. A groundwater management policy involving the salvaging of water dicharged naturally into the sea and estuaries, the selective dispersion of centers of well water withdrawal, and the careful management of waste disposal practices is recommended. (See also W76-11224) (Kreager-FIRL)
W76-11618

5G. Water Quality Control

MUNICIPAL WASTES AS A FERTILIZER SOURCE,
Nebraska Univ., Lincoln. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5D.
W76-11117

BELGIUM (LEGISLATION ON UNDERGROUND WATERS).
Food and Agriculture Organization of the United Nations, Rome (Italy).
For primary bibliographic entry see Field 6E.
W76-11120

ENGLAND AND WALES, (LEGISLATION ON UNDERGROUND WATERS).
Food and Agricultural Organization of the United Nations, Rome (Italy).
For primary bibliographic entry see Field 6E.
W76-11121

FRANCE, (LEGISLATION ON UNDERGROUND WATERS).
Food and Agricultural Organization of the United States, Rome (Italy).
For primary bibliographic entry see Field 6E.
W76-11122

ISRAEL, (LEGISLATION ON UNDERGROUND WATERS).
Food and Agricultural Organization of the United Nations, Rome (Italy).
For primary bibliographic entry see Field 6E.
W76-11123

ITALY, (LEGISLATION ON UNDERGROUND WATERS).
Food and Agricultural Organization of the United Nations, Rome (Italy).
For primary bibliographic entry see Field 6E.
W76-11124

SPAIN, (LEGISLATION ON UNDERGROUND WATERS).
Food and Agricultural Organization of the United Nations, Rome (Italy).
For primary bibliographic entry see Field 6E.
W76-11125

TURKEY, (LEGISLATION ON UNDERGROUND WATERS).
Food and Agricultural Organization of the United States, Rome (Italy).
For primary bibliographic entry see Field 6E.
W76-11126

MARGINAL POLLUTION ANALYSIS FOR LONG RAGE FORECASTS,
Cornell Univ., Ithaca, N. Y. Center for Urban Development Research.
W. Isard, F. J. Cesario, and T. A. Reiner.
Regional Science Dissertation and Monograph Series No. 4, Center for Urban Development Research, Cornell University, Ithaca, New York, June 1975. 529 p, 31 fig, 133 tab, 113 ref, 14 appen.

Descriptors: *Methodology, *Forecasting, Effects, *Water pollution, *Air pollution, *Solid wastes, Industrial wastes, Domestic wastes, Transportation, Economics, Human population, Regional analysis, New York, Mathematical models, Systems analysis.
Identifiers: *Urban regions.

A practical method for forecasting the implications of growth for marginal (additional) pollution--air, water and solid waste--has been developed

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with reference to various kinds of urban regions. The analysis framework explicitly recognizes the interrelated nature of the pollution generated by industrial, household and transportation sources. Two submodels compose the framework: (1) an industrial-household emissions submodel; and (2) a transportation emissions submodel. These submodels are fully operational and can be used at low cost to test and examine the pollution implications of a wide variety of assumptions on the nature and direction of economic and population growth on a regional or subregional basis. The submodels were applied to a representative set of seven urban regions to test the different effects of age, size, pollution control technology, and urban form in a marginal growth context. Included in this set were five existing New York State urban regions and two prototype, hypothetical cities. The importance of the transportation sector in marginal pollution analysis was clearly established. A method was developed for examining the transportation emissions implications which are both direct and indirect. This study resulted in considerable advances in data collection, analysis and management. Its analysis framework can be used for a variety of purposes in the formulation of environmental policy. (Bell-Cornell)
W76-11127

A MATRIX APPROACH FOR DETERMINING WASTEWATER MANAGEMENT IMPACTS,
Weston (Roy F.), New York.
K. J. Phillips, and J. A. DeFilippi.
Journal of the Water Pollution Control Federation, Vol. 48, No. 7, p 1759-176, July 1976. 5 fig, 3 tab, 4 ref.

Descriptors: *Waste water(Pollution), *Management, Evaluation, Project planning, Equations, Systems analysis, Methodology.
Identifiers: *Matrix approach, *Environmental impact.

A methodology is developed and demonstrated to quantify and rank the relative environmental impacts of alternative wastewater management systems. The approach first identifies and objectively assigns weights to various environmental categories. Project components are then listed and relative environmental impacts are calculated for each environmental category by using functional relationships. The results are incorporated into a matrix and a final relative environmental impact is numerically calculated for each alternative. The approach was initially developed for water resources projects, but it has been modified and adopted to evaluating wastewater management systems. (Bell-Cornell)
W76-11128

POLITICAL RESOLUTION OF ENVIRONMENTAL CONFLICTS,
Waterloo Univ. (Ontario). Dept. of Systems Design.
For primary bibliographic entry see Field 6G.
W76-11129

FEM COUPLED WITH LP FOR WATER POLLUTION CONTROL,
Hiroshima Inst. of Tech., Itsukaichi (Japan).
For primary bibliographic entry see Field 5B.
W76-11134

COST SHARING TO INDUCE EFFICIENT TECHNIQUES OF ABATING WASTEWATER POLLUTION,
National Bureau of Standards, Washington, D.C., Building Economics Section.
H. E. Marshall, and R. T. Ruegg.
Journal of Environmental Economics and Management, Vol. 2, No. 2, p 107-119, December 1975. 5 tab, 3 equ, 13 ref.

Descriptors: *Waste water(Pollution), *Cost sharing, *Pollution abatement, *Water quality control, Evaluation, Effects, Measurement, Equations, Operation and maintenance, Costs, Optimization, Constraints, Systems analysis.
Identifiers: Bias, Least-cost, Benefit maximization.

This paper analyzes existing cost-sharing rules for wastewater pollution grants administered by the Environmental Protection Agency under the 1972 Amendments to the Federal Water Pollution Control Act. It identifies and measures biases in the existing cost-sharing rules that encourage nonfederal interests to select particular techniques (e.g., capital-intensive techniques) over others even when the selected techniques are not the least costly to the nation. The paper develops theoretically a cost-sharing condition -- that the same percentage cost share be applied to all abatement techniques -- that would eliminate the cost-sharing bias. Alternative cost-sharing approaches are evaluated in terms of their biasing effects and their absolute dollar costs for federal and nonfederal project participants. In conclusion, existing rules for the cost sharing of wastewater pollution abatement appear to bias nonfederal interests toward particular techniques, expecially construction-intensive over operation and maintenance and land site-intensive techniques. (Bell-Cornell)
W76-11135

RESPONSE OF SOUTH PLATTE TO EFFLUENT LIMITATIONS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W76-11137

ESTIMATED COSTS OF MECHANICAL CONTROL OF WATER HYACINTHS,
Georgia Univ., Athens. Dept. of Agricultural Economics.
M. J. Mara.
Journal of Environmental Economics and Management, Vol. 2, No. 4, p 273-294, April 1976. 2 fig, 6 tab, 24 ref.

Descriptors: *Water hyacinths, *Water quality control, *Harvesting, *Dynamic programming, *Linear programming, Optimization, Constraints, Biology, Lakes, Size, Equations, Control, Marginal costs, Costs, Mathematical models, Systems analysis.
Identifiers: *Cost minimization, Infestation, Mechanical control, Control strategy, Operating policy.

Water hyacinths are detrimental to the environment in many ways, directly or indirectly affecting all people living in or using an area infested by the weeds. Presented is an application of dynamic linear programming for purposes of achieving the minimum cost strategy for the mechanical harvesting method of controlling water hyacinths in Florida. The optimization model was developed and applied to a hypothetical lake to determine the least-cost method and seasonal pattern of removal to attain specified levels of control. Results indicate that for a 400-acre lake under specified conditions, the annual costs of controlling water hyacinths run to $13,500 or $33.75 per acre. These costs increase as the initial amount of infestation from which geometric growth of the biomass occurs and/or the size of the water body increases. (Bell-Cornell)
W76-11141

DYNAMIC MODELLING AND CONTROL APPLICATIONS IN WATER QUALITY MAINTENANCE,
Cambridge Univ. (England). Dept. of Engineering.
M. B. Beck.
Water Research, Vol. 10, No. 7, 1976, p 575-595. 4 fig, 13 equ, 51 ref.

Descriptors: *Water quality control, *System analysis, *Hydrologic aspects, Technology, Instrumentation, Management, Rivers, Mathematical models, Operations research, Estimation, Equations, Water supply, Water distribution(Applied), Treatment facilities, Waste water treatment, Sewers, Networks, Urban runoff, Dissolved oxygen, Biochemical oxygen demand, Flow.
Identifiers: Biological processes.

A unified, systematic approach to problems of water quality management has been developed. A water quality system is defined as the following group of component features: the abstraction, purification, and supply of potable water from a river; consumer effluent, rainfall-runoff from the urban land surface, and the sewer network; the wastewater treatment plant; and the river itself. A systems analysis approach to the study of the dynamic and control aspects of the system is discussed, with particular reference to the practical limitations of instrumentation and technology. In an attempt to blend the theory with the practice, recent studies on the dynamic modeling and control of parts of the water quality system are reviewed. Special attention is paid to the practical application of techniques of system identification and parameter estimation. Finally, pieces together several individual results, it is possible to give a good indication of the manner in which control studies should be directed in the near future. It is concluded that of the modeling problems still remaining, the outstanding challenge to the dynamic systems analyst is that of biological process modeling: more attention must be given to the achievement of a proper understanding of, for example, the substrate/micro-organism relationships of activated sludge and anaerobic digestion as applied to river water quality. (Bell-Cornell)
W76-11142

VILLAGE WATER SUPPLY, A WORLD BANK PAPER.
International Bank for Reconstruction and Development, Washington, D. C.
March 1976. 96 p, 19 tab, 14 ref.

Descriptors: *Water supply, *Rural areas, *Water quality, *Public health, Economics, Management, Investment, Projects, Water resources development, Costs, Benefits, Planning, *Domestic water, Water quality standards.
Identifiers: *World Bank(Washington D. C.), Developing countries, Villages.

The supply of water for domestic use in the rural areas of the developing world is considered. The rate at which access to safe water is being provided for these populations is too slow to keep pace with the birth rate. In these countries, water-borne or water-related diseases are among the three major causes of sickness and death. The World Health Organization considers that provision of a safe and convenient water supply is the single most important activity that could be undertaken to improve the health of people living in rural areas. The World Bank has been shifting the emphasis of its lending program so as to have greater impact on the rural population through projects in agriculture and integrated rural development; rural water supply and sanitation should be a significant component of these projects. Because rural water supply has hitherto been largely neglected, experience and knowledge are lacking to set specific targets for action. As a first step this paper concentrates on the problems peculiar to this subsector and suggests ways to begin to overcome the current state of neglect. (Bell-Cornell)
W76-11143

A STOCHASTIC PROGRAMMING MODEL APPLIED TO WATER RESOURCES MANAGEMENT,
Computing Center for Universities, Budapest (Hungary).

rimary bibliographic entry see Field 4A.
11144

GRATED CONTROL OF ALLIGATOR
D AND WATER HYACINTH IN TEXAS.
Engineer Waterways Experiment Station,
burg, Miss.
able from the National Technical Informa-
Service, Springfield, Va 22161 as ADA-008
3.50 in paper copy $3.00 in microfiche.
ical Report No. 9, March 1975. 112 p.

iptors: *Alligatorweed, *Aquatic weed con-
Water hyacinth, *Texas, Mechanical con-
Herbicides, Diquat, 2,4-D, Biocontrol,
east U.S., Cost-benefit ratio, Application
ds, Algal control, Pesticide drift, Emul-
Pesticide residues, Insect control, Toxicity,
ence, Environmental effects, Integrated
l measures.
iers: Phenoxy herbicides.

ram of control and eradication of economi-
ndesirable aquatic plants in coastal and al-
ters is essential. The Aquatic Plant Control
m was established in 1958 as a cooperative
between eight southeastern coastal states.
ent of 200,000 acres of water hyacinth and
r weed costs about $4,000,000 annually and
almost $14,000,000 in benefits. Silvex, 2,4-
othall, and diquat are used to treat water
h, alligator weed, water milfoil, Egeria,
drilla. Average annual benefits are about
0 with a benefit-cost ratio of 6.7. The alliga-
d flea beetle was used to reduce alligator
nd 2,4-D to control water hyacinth. Control
oxy herbicide spray droplet size reduces
lerbicides may be applied in water-in-oil
and bivert) emulsions. Control with herbi-
easier, faster, longer lasting, and less ex-
than mechanical control. Toxicity, per-
, and decomposition of phenoxy herbicide
are discussed. The aquatic plant control
in Texas is described. (See W76-11146
6-11152) (Buchanan-Davidson-Wisconsin)
145

T STATEMENT FOR THE AQUATIC
CONTROL PROGRAM-STATE OF

ngineer District, Galveston, Tex.
ary bibliographic entry see Field 6G.
46

IC PLANT CONTROL PROGRAM FOR
TOR WEED AND WATER HYACINTH
AS,
rks and Wildlife Dept. Houston.
mbric, L. V. Guerra, D. M. Maddox, and
ngstad.
atic Plant Control Program: Integrated
of Alligator Weed and Water Hyacinth in
Army Engineer Waterways Experiment
Vicksburg, Miss., Technical Report No.
1975, p C3-C13. 2 fig., 2 tab.

rs: *Aquatic weed control, *Integrated
easures, Alligatorweed, Insects, Water
Biocontrol, *Texas, Herbicides, Fresh-
rshes, Community development, Reser-
es of application, Irrigation water, Water
uations, Potable water, 2,4-D, Spraying,
drift.
s: Agasicles hygrophila.

weed flea beetles (Agasicles hygrophila)
ased in alligator weed infestations in the
. Murphree Wildlife Management Area,
reshwater marsh, and Dam B Reservoir.
blished well and dispersed widely. Most
weeds suffered heavy feeding damage;
growing on the flats did not seem suita-
a beetles because the weeds dried up
awdowns or were flooded during high
tural factors limiting flea beetle popula-

tions are climatic. Frost eliminates the host plant's serial portions on which beetles feed, so populations are limited and insufficient beetles are present when the plant's growth cycle is most susceptible. Rapid water level change from rainfall and hurricane intensity winds are other abiotic factors. Water hyacinth was controlled by spraying with amine salts of 2,4-D. The butoxyethanol ester of 2,4-D was used in potable water sources. Spraying when crop production was at a minimum reduced damage from drifting. There were generally no harmful effects from control operations on water supplies. Aerial applications are made with concentrated formulations in invert emulsions or similar carriers to prevent drift. After initial clearing, maintenance may needed yearly for 4-5 years. When practicable, vegetation can be cut from anchorage and allowed to drift to salt water. (See also W76-11145) (Buchanan-Davidson--Wisconson)
W76-11147

FUNDAMENTALS OF DRIFT CONTROL BY DROPLET SIZE SELECTION,
Hercules Powder Co., Wilmington, Del. Synthetics Dept.
L. O. Hill.
In: Aquatic Plant Control Program: Integrated Control of Alligator Weed and Water Hyacinth in Texas, Army Engineer Waterways Experiment Station, Vicksburg, Miss., Technical Report No. 9, March 1975, p. D3-D8. 8 tab.

Descriptors: *Weed control, *Pesticide drift, *Drops(Fluids), *Herbicides, 2,4-D, Stoke's Law, Particle size, Application equipment, Application methods, Rates of application, Sprays, Emulsions.

Although 2,4-D is a very active, selective weed killer, it has caused much damage, largely due to drift. Droplet drift is the distance a crosswind will blow it in the time the droplet is falling. Stoke's Law can be used to predict drift, calculate rate of application, and determine the time it takes different droplet sizes to fall depending on crosswind speed and height it is sprayed from. Although larger particles drift less, droplet size also determines covering ability. Droplets large enough to contain drift but small enough to spray the required number of droplets per square inch to kill are generated by a bifluid spray system. No premixing is required as the herbicide concentrate becomes the oil phase. The nozzle contains the mixing chamber the energy created by swirling action inherent in the nozzle design inverts the emulsion from the water to the oil phase. This water-in-oil emulsion exhibits a plastic-type rheological behavior with a yield point of about 100 g's, which prevents further breaking once spherical droplets are formed. The invert droplet reduces water evaporation while the droplet is falling to the ground. Use of helicopters, fixed-wing airplanes, backpack sprayers, tractors, and blowers give great versatility to this spray system. (See also W76-11145) (Buchanan-Davidson--Wisconsin)
W76-11148

NEW TECHNIQUES IN VEGETATION MAINTENANCE ON MILITARY RESERVATIONS,
Stull Chemical Co., San Antonio, Tex.
D. P. Petersen, O. H. Hayes, and C. R. True.
In: Aquatic Plant Control Program: Integrated Control of Alligator Weed and Water Hyacinth in Texas, Army Engineer Waterways Experiment Station, Vicksburg, Miss., Technical Report No. 9, March 1975, p. E3-E12. 5 tab.

Descriptors: *Aquatic weed control, *Herbicides, *Brush control, *Weed control, *Grasses, *Emulsion, 2,4-D, Dalapon, Adjuvants, Spraying, Toxicity, Alligatorweed, Water Hyacinth, Pondweeds, Pesticide drift, Rates of application, Application equipment.
Identifiers: *Stull Bifluid System, Dicamba, Monosodium-methanarsonate, Bromacil, Ammonium sulfamate, Duckweed.

The Fourth Army uses water-in-oil (invert) herbicide emulsions for grounds maintenance containing either 2,4-D, dicamba, dalapon, monosodium-methanarsonate, bromacil, or ammonium sulfamate mixed with spray adjuvant plus diesel oil. Toxicant dose rates of some herbicides may be reduced because of greater confinement of spray to the target. Ammonium sulfamate and monosodium-methanarsonate in an invert emulsion base gives general vegetation control without soil contamination. It is effective on woody plant growth when applied heavily along fence lines and around buildings, poles, trees, etc. The Stull Bifluid System using adjuvants with phenoxy herbicides to control aquatic emergent weeds (alligator weed, duckweed, pondseed, water hyacinth) causes little water contamination and drift and the maximum amount of active herbicide is concentrated on target weeds. Single applications of phenoxy herbicides on susceptible emergent aquatic weeds were enough, but species susceptibility differed. Low volatile emulsifiable concentrates are recommended. Minimum application rates with small droplets should be used when drift is minimal, but maximum rates with large droplets should be used when drift is critical. How to select herbicide dose rates, water and oil premixes, and water to oil ratios; calculation of sprayer outputs; of metering orifices; and calibration of sprayers is shown. (See also W76-11145) (Buchanan-Davidson--Wisconsin)
W76-11149

HERBICIDES AS ANTIPOLLUTANTS,
Agricultural Research Service, Laramie, Wyo. Crops Research Div.
F. L. Timmons.
In: Aquatic Plant Control Program: Integrated Control of Alligator Weed and Water Hyacinth in Texas, Army Engineer Waterways Experiment Station, Vicksburg, Miss., Technical Report No. 9, March 1975, p. F3-F19. 7 tab.

Descriptors: *Aquatic weed control, *Herbicides, *Algal control, *Riparian plants, Copper sulfate, Potable water, Diquat, Sodium arsenite, 2,6-Dichlobenil, Monuron, Safety, 2,4-D, Submerged plants, Floating plants, Fish, Pesticide residues, Resistance, Irrigation water, Toxicity, Dalapon, Persistence, Agronomic crops, Hydrosols(Soils).
Identifiers: Dichlone, Acrolein, Endothall, Xylene, Petroleum oils, Fenac, Diuron, Ammonium sulfamate, Bromacil, Sodium TCA, Silvex.

Approximately 150 different aquatic or water weeds are considered pollutants; many convert inorganic nutrients into organic matter, remove carbon dioxide, add dissolved oxygen to water, are food sources or provide suitable habitats for fish, etc. Aquatic plant growth, density, vigor, and nutrient concentrations are increasing in most areas and causing problems. Twenty herbicides are registered for control of aquatic and bank weeds: copper sulfate and dichlone for algae; acrolein, diquat, endothall, petroleum distillate, sodium arsenite, dichlobenil, fenac, diuron, monuron, and ester formulations of silvex and 2,4-D for submersed seeds; diquat, silvex, and 2,4-D for floating aquatic weeds; and ammonium sulfamate, bromacil, dalapon, sodium TCA petroleum oils, silvex, and 2,4-D for emersed, marginal, or bank weed control. The amount and persistence of herbicide residues in water and fish can determine if a herbicide is a pollutant. Results on the persistence of 2,4-D, diquat, endothall, dichlobenil, fenac, and silvex in water and fish are presented. Studies are being conducted on herbicide residues in water, hydrosoil, and irrigated crops, their toxicities to animals and humans, and the presence and fate of possible harmful degradation products. (See also W76-11145) (Buchanan-Davidson--Wisconsin)
W76-11150

PHENOXY HERBICIDE RESIDUES AND THEIR PERSISTENCE,
Midwest Research Inst., Kansas City, Mo.
For primary bibliographic entry see Field 5B.

LIBRARY U. OF I. URBANA-CHAMPAIGN

W76-11151

AQUATIC PLANT CONTROL PROBLEMS AT SAM RAYBURN RESERVOIR,
Army Engineer District, Fort Worth, Tex.
E. Mayer.
In: Aquatic Plant Control Program: Integrated Control of Alligator Weed and Water Hyacinth in Texas, Army Engineer Waterways Experiment Station, Vicksburg, Miss., Technical Report No. 9, March 1975, p. H3-H11. 1 fig.

Descriptors: *Aquatic weed control, *Herbicides, *Texas, Water hyacinth, Alligatorweed, 2,4-D, Emulsions, Spraying, Mosquitoes, Reservoirs, Biocontrol, Economic impact.
Identifiers: Silvex, Agasicles hygrophila, *Sam Rayburn reservoir(Tex).

The Town Bluff Dam-B. A. Steinhagen Lake and the Sam Rayburn Reservoir, Texas, have serious problems with water hyacinth and alligator weed growth. The proposed control program will consist of an initial treatment in the fall, with concentrated treatment in the spring, and follow-up treatment later. The most efficient control agent appears to be 2,4-D; the alligator weed flea beetle has helped but not enough for complete control. It has been proposed to use a water solution of the amine salt or butoxyethanol ester of 2,4-D to control water hyacinth at both reservoirs (3000 acres) and an isoctyl or low volatile ester formulation of 2,4-D-trichlorophenoxyacetic acid (silvex) as a conventional spray or invert emulsion from rotary aircraft for alligator weed control in the B.A. Steinhagen Lake (1000 acres) in 1975. Control of these weeds would help prevent breeding of mosquitoes, make lakeside areas useable, prevent flooding caused by hyacinth mats, and increase recreational use. Use of herbicides should not cause safety hazards. Concentration of the chemicals should not occur. Usually these chemicals have not caused fish kills or decreased fishing success. (See also W76-11145) (Buchanan-Davidson--Wisconsin)
W76-11152

COST BENEFIT ANALYSIS AND WATER POLLUTION POLICY.
Urban Inst., Washington, D.C.
Environmental Protection Agency and Urban Institute Symposium, September 5-7, 1973, Annapolis, Md. H. M. Peskin and E. P. Seskin, editors. Published in 1975, 370 p, URI 77000. $5.95.

Descriptors: *Water pollution control, *Econometrics, *Cost-benefit analysis, *Theoretical analysis, *Evaluation, *Measurement, *Estimating, Water quality standards, Indirect benefits, Direct benefits, Intangible benefits, Intangible costs, Costs, Indirect costs, Institutional constraints, Industrial wastes, Environmental effects, Project benefits, Comprehensive planning, Future planning(Projected), Risks, Analytical techniques.

This volume contains the contributions to a symposium sponsored by the Environmental Protection Agency concerning the major problems involved in environmental cost-benefit analysis, together with a comprehensive editorial overview of its basic concepts. Discussions in Part One relate to the concepts of benefits in cost-benefit analysis with emphasis on water pollution control; a survey of the techniques for measuring the benefits of water quality improvement; institutional and conceptual thoughts on benefit studies. Part Two relates to cost methodology and measurement as detailed in costs of water quality improvement, transfer functions, and public policy; environmental policy costs and their definition, measurement, and conjecture; and estimates of industrial waterborne residuals control costs with a review of concepts, methodology and empirical results. Part Three deals with the future and uncertainty as detailed in valuing long-run ecological consequences and irreversibilities. Part Four considers policy issues and institutions as discussed in voting, cost-benefit analysis and water pollution policy; property-right specification and 'distribution' in cost-benefit analysis; individual project analysis vs. comprehensive planning; cost-benefit analyses of cost-benefit analysis; and the role of cost-benefit in policy making. (See W76-11154 thru W76-11166) (Auen-Wisconsin)
W76-11153

THE CONCEPT OF BENEFITS IN COST-BENEFIT ANALYSIS: WITH EMPHASIS ON WATER POLLUTION CONTROL ACTIVITIES,
Wisconsin Univ., Madison. Dept. of Economics.
R. H. Haveman, and B. A. Weisbrod.
In: Cost Benefit Analysis and Water Pollution Policy, Environmental Protection Agency and Urban Institute Symposium, September 5-7, 1973, Annapolis, Md. Published in 1975, p. 37-66. 1 fig., 31 ref.

Descriptors: *Water pollution control, *Cost-benefit analysis, *Benefits, *Evaluation, Welfare(Economics), Resource allocation, Equity, Direct benefits, Indirect benefits, Intangible benefits, Tangible benefits, Economic efficiency, Compensation.
Identifiers: Option value.

The fundamental meaning of 'benefits' is explored in connection with cost-benefit analysis of public activities, particularly as they apply to water pollution control. First, the conceptual issues of benefits are explored, followed by a discussion and analysis of the 'new welfare economics' which give the concept meaning; then the willingness-to-pay criterion is developed, particularly examining the relationships between benefits and the economic concepts of efficiency and equity. Secondly, the discussion focuses on efficiency and a determination of which types of benefits are or are not properly included in a correctly defined concept of efficiency benefits. Also discussed are the distinctions between primary and secondary benefits, real and pecuniary benefits, external and internal benefits, and tangible and intangible benefits. Then the issues of option price and option value, and donor benefits and equity effects are explored. The fundamental point stressed is the distinction between the 'real social' effects (benefits or costs of a project--those effects that expand the production and consumption potential for the entire society--and the 'pecuniary private' effects--those that do not expand the total potential, but rather, expand it for some persons and contract it for others. (See also W76-11153) (Auen-Wisconsin)
W76-11154

A SURVEY OF THE TECHNIQUES FOR MEASURING THE BENEFITS OF WATER QUALITY IMPROVEMENT,
Bowdoin Coll. Brunswick, Maine. Dept. of Economics.
A. M. Freeman.
In: Cost Benefit Analysis and Water Pollution Policy, Environmental Protection Agency and Urban Institute Symposium, September 5-7, 1973, Annapolis, Md. Published in 1975, p. 67-104. 7 fig., 37 ref.

Descriptors: *Cost-benefit analysis, *Water pollution control, *Benefits, *Measurement, *Estimating, Analytical techniques, Welfare(Economics), Econometrics.

The techniques for obtaining monetary measures of the benefits of water pollution control are described and evaluated. The three essential conditions which any technique of benefit estimation must meet if it is to fulfill the needs of water resource planners are: (1) The technique must lead to monetary measures of values or benefits; (2) it must be firmly based on economic theory and concepts of willingness-to-pay and of consumer and producer surplus; and, (3) that some measure of water quality explicitly enters the analysis as a variable. A classification of benefits and the techniques for estimating the kinds of benefits in each classification, is provided in terms of the ways in which changes in water quality enter into the economic processes to become or produce economic goods with values attached to them. The focus is on the necessity for establishing the relationship between changes in abatement levels, changes in quality parameters, and changes in the uses of water as a precondition to estimating the value of improved water quality. The impoundables are how to specifically relate abatement measures to quality changes and uses, the indices of water quality relevat to recreational uses, or how people will respond to changes in different quality parameters, and the links between the quality parameters and discharge rates. (See also W76-11153) (Auen-Wisconsin)
W76-11155

SOME INSTITUTIONAL AND CONCEPTUAL THOUGHTS ON THE MEASUREMENT OF INDIRECT AND INTANGIBLE BENEFITS AND COSTS,
Wisconsin Univ., Madison. Dept. of Economics.
For primary bibliographic entry see Field 6B.
W76-11156

A SURVEY OF EMPIRICAL BENEFIT STUDIES,
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 6B.
W76-11157

COSTS OF WATER QUALITY IMPROVEMENT, TRANSFER FUNCTIONS, AND PUBLIC POLICY,
Resources for the Future, Washington, D.C.
A. V. Kneese.
In: Cost Benefit Analysis and Water Pollution Policy, Environmental Protection Agency and Urban Institute Symposium, September 5-7, 1973, Annapolis, Md. Published in 1975, p. 175-205. 7 fig, tab., 19 ref.

Descriptors: *Cost-benefit analysis, *Water pollution control, *Water policy, *Costs, *Water quality standards, Estimating, Methodology, Industrial wastes, Environmental effects, Mathematical models, Regional analysis.
Identifiers: *Social costs, Opportunity costs, Effluent standards, Ambient standards, Streeter-Phelps equations, Transfer functions.

The discussion centers on the wide variations in the possible costs of controlling water quality. Costs depend upon the levels of water quality contemplated, the strategies envisaged for implementing management programs, the range of technologies admitted, and the restrictions set upon impacts on other environmental media. Detailed regional case studies have been particularly illuminating with respect to the cost-effectiveness of various implementation strategies. These studies have shown the inefficiency of uniform discharge reduction approaches, the potential of effluent charges for approximating least-cost distributions of discharge reduction at individual outfalls, the applicability and efficiency of a wide range of technologies in a regional river-basin context, and the importance of considering direct interdependencies between the various environmental media. These analyses were made possible by combining cost estimates, economic models, and transfer functions into coherent analytical devices. The national water quality control policy is found deficient, as contrasted with the major West European countries, little attention has been given to cost-effectiveness. Economic models are presented illustrating transfer functions for cost analysis, cost minimization and the location of discharges, and a multiple residuals regional management model. It is suggested that pollution control can be more e

tive when administered at a regional rather than national level. (See also W76-11153) (Auen-sconsin)
'6-11158

VIRONMENTAL POLICY COSTS: DEFINI-ON, MEASUREMENT, AND CONJECTURE,
ifornia Univ., Riverside.
C. D'Arge.
Cost Benefit Analysis and Water Pollution Pol- Environmental Protection Agency and Urban itute Symposium, September 5-7, 1973, An-olis, Md. Published in 1975, p. 207-229. 2 fig.

criptors: *Cost-benefit analysis, *Water pollu- control, *Institutions, *Management, *Costs, surement, Water quality standards, Decision ing, Pollution abatement, Planning.
tifiers: *Policy costs.

cy costs are defined as the costs of informa- enforcement, and administration to achieve a ic objective, such as water quality improve-t, with emphasis on cost minimization. des the agency's general objectives it must tify the mandate, scope, objectives, and rele- processes of water quality management and nagnitude of its initial and expected budget. considerations in the decision on objectives, late, and budget are typified and the measur- f policy costs examined within the context of del based on the assumptions of that which is mal' will vary according to the objectives of constitutional body; and that this body will ion at the Pareto-efficient point subject to its traints; and by including the implications that butional consequences are either not of con- to the institution or are resolved via lump- transfers or other means. The model and its lying assumptions are examined in the light e 'degree of directness' of control measures e postulate that the degree of directness in- es with a decline in the number of behavioral hnological interpositions between the control y and private decisions. In the absence of es, controls (such as penalties and rules) ne 'absolutely' direct. Some conditions must be mandated for a water quality gement authority to be viable and efficient liscussed. (See also W76-11153) (Auen-nsin)
1159

MATES OF INDUSTRIAL WATERBORNE UALS CONTROL COSTS: A REVIEW OF EPTS, METHODOLOGY, AND EMPIRI-RESULTS,
Hopkins Univ., Baltimore, Md.
Ianke, and I. Gutmanis.
st Benefit Analysis and Water Pollution Pol- nvironmental Protection Agency and Urban te Symposium, September 5-7, 1973, An-, Md. Published in 1975, p. 231-268. 7 fig., 7 ref.

otors: *Water pollution control, *Cost- analysis, *Costs, *Estimating, *Industrial *Waste treatment, Methodology, ing, Byproducts, Optimization.

vironmental Protection Agency-sponsored ial pollution control studies are criticized they cannot be used as ex ante policy n determining trade-offs between costs and of appropriate levels of residuals ges. Some of the major shortcomings of udies are: The estimation of gross costs or tures rather than net residuals manage- sts are of little value in policy making and e the net resources that are foregone. End- treatment has been considered the most ef- and/or the only means of controlling s without consideration of the product out- input variables, and of their influence sts. In-plant process changes that affect and byproduct production--which, in turn, affect the effluents--have been given only cursory attention. The importance of single plant firm vs. the multiple plant firm has not been treated. The EPA studies have not dealt with the administrative and bureaucratic costs of implementing various types and levels of control, and which must be incorporated into the estimate of net residuals management costs. A proper methodology for dealing with these trade-offs in formulating residual discharge strategies is embodied in the studies conducted at Resources for the Future, which analyze the relevant factors that influence net residuals management costs and avoid the shortcomings usually implicit in considering industrial waste treatment costs. (See also W76-11153) (Auen-Wisconsin)
W76-11160

VALUING LONG-RUN ECOLOGICAL CONSEQUENCES AND IRREVERSIBILITIES,
Maryland Univ., College Park. Dept. of Economics.
For primary bibliographic entry see Field 6G.
W76-11161

COST-BENEFIT ANALYSIS, PROPERTY RIGHT SPECIFICATION AND 'DISTRIBUTION',
Rand Corp., Santa Monica, Calif.
For primary bibliographic entry see Field 6B.
W76-11162

PROJECT-BY-PROJECT ANALYSIS VS. COMPREHENSIVE PLANNING,
Environmental Protection Agency, Washington, D.C.
F. H. Abel.
In: Cost Benefit Analysis and Water Pollution Policy, Environmental Protection Agency and Urban Institute Symposium, September 5-7, 1973, Annapolis, Md. Published in 1975, p. 333-339. 4 ref.

Descriptors: *Cost-benefit analysis, *Pollution abatement, *Regional analysis, *Comprehensive planning, Methodology.

The planning and implementation problems involved in choosing the scope of pollution abatement cost-benefit analysis, both with respect to the geographic area to be included in the analysis and the number of pollutants to be considered are discussed. It is recommended that an area in which significant social, economic, and political interdependencies form a relatively self-contained unit, and that the environmental plan for the unit should include all major pollutant categories: air, water, solid waste, and hazardous materials. The cost-benefit analysis should be based on a single pollutant, media, or multimedia and multipollutant basis depending on synergism among pollutants and the degree to which the control technology can be refined. The level of detail for comprehensive analysis and the ability to aggregate for regional analysis, at a minimum, should include the flow of residuals into the area, generation and assimilation of residuals within the area, and the flow of residuals from the area, and should also quantify the effects of these residuals and the costs of control functions for all sources. When analyzing multiple-objectives, a single cost-benefit ratio may not be the most meaningful or useful result because any proposed program may affect the objectives in different ways. However, a single ratio can be obtained if the costs and the benefits of the different objectives are weighed. (See also W76-11153) (Auen-Wisconsin)
W76-11163

COST-BENEFIT ANALYSES OF COST-BENEFIT ANALYSIS,
California Univ., Riverside. Dept. of Economics.
For primary bibliographic entry see Field 6B.
W76-11164

THE ROLE OF COST-BENEFIT ANALYSIS IN POLICY MAKING,
Stanford Univ., Calif.
For primary bibliographic entry see Field 6B.
W76-11165

VOTING, COST-BENEFIT ANALYSIS, AND WATER POLLUTION POLICY,
Resources for the Future, Washington, D. C.
P. R. Portney.
In: Cost Benefit Analysis and Water Pollution Policy, Environmental Protection Agency and Urban Institute Symposium, September 5-7, 1973, Annapolis, Md. Published in 1975, p. 293-311. 5 fig., 31 ref.

Descriptors: *Cost-benefit analysis, *Water pollution control, *Political aspects, *Social participation, *Decision making, Resource allocation, Cost sharing, Income distribution, Public benefits, Benefit sharing.
Identifiers: Voting franchise.

The role of political mechanisms in the allocation of resources to water quality program is discussed, with special attention directed to the uses of referendum voting by individuals and the uses of legislative voting (and votetrading) by elected representatives. The nature of water quality programs and the reasons why the market cannot provide a satisfactory allocation of resources, and the way in which individual voting might help choose the optimal level of output of an essentially indivisible 'social good', like water quality, are examined. Also examined is how legislative voting may be expected to alter patterns of resource allocation, especially in the area of water quality. The conclusions are that it is unreasonable to believe that individual voting can lead to the optimal level of water quality unless symmetrical distribution of preferences is produced and the costs of social goods are equally allocated by income redistribution through explicit taxes and transfers. The increased use of referenda is an indication of dissatisfaction with the results of cost-benefit analysis, either due to inaccuracies or to perverse distributional effects. The proper sphere of water quality management is in federal, state, or local legislative bodies in conjunction with other issues of concern, as those responsible for water quality decision should also be those that are equally responsible for decisions on other social goods. (See also W76-11153) (Auen-Wisconsin).
W76-11166

EFFECT OF TILLAGE SYSTEMS ON RUNOFF LOSSES OF PESTICIDES: A SIMULATED RAINFALL STUDY,
Iowa State Univ., Ames. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W76-11169

PROCEEDINGS OF THE SOUTHEASTERN CONFERENCE ON WATER SUPPLY AND WASTEWATER IN COASTAL AREAS,
North Carolina Water Resources Research Inst., Raleigh.
For primary bibliographic entry see Field 5D.
W76-11224

SOME PRACTICAL PROBLEMS IN DEVELOPING AND PRESENTING ENVIRONMENTAL QUALITY INDICES TO THE PUBLIC,
Environmental Protection Agency, Seattle, Wash. Region X.
L. E. Coate, and A. K. Mason.
In: International Conference on Environmental Sensing and Assessment, Vol. 2, September 14-19, 1975, Las Vegas, Nevada, p 31-2-1 - 31-2-4. 1 tab.

Descriptors: *Indicators, *Data processing, *Water quality, *Evaluation, Rivers, Regional analysis, Water pollution effects, Measurement, Monitoring, *Water quality standards.

LIBRARY U. OF I. URBANA-CHAMPAIGN

Identifiers: Environmental indices.

The rationale for selecting specific environmental quality indices is presented along with an example of the establishment of a regional water quality index. Guidelines for the adoption of indices include: their ability to be understood by the public, their ability to relate to standards or legislative goals as well as to health and lifestyle; their flexibility for updating, and their usefulness for assisting in program management and resource allocation. An example of the application of these guidelines is presented in the form of a water quality index which is based on the percentage of the river or river miles meeting water quality standards. The index involves the utilization of 10 pollution categories: dissolved oxygen, temperature, pH, aesthetics, total dissolved gases, total dissolved solids, radioactivity, pathogens, organic toxicants, and inorganic toxicants. The criterion used for determining whether a violation exists is the state-established health standard for that particular river at a given location. (See also W76-10637) (Kreager-FIRL)
W76-11246

TOWARDS A COMPUTER-BASED INFORMATION MONITORING SYSTEM FOR GROUNDWATER DATA IN NEW ZEALAND,
Illinois Univ. at Chicago Circle. Dept. of Geological Sciences.
For primary bibliographic entry see Field 4B.
W76-11247

PROCEEDINGS OF THE ANNUAL CONFERENCE, ONTARIO SECTION, AMERICAN WATER WORKS ASSOCIATION; POLLUTION CONTROL ASSOCIATION OF ONTARIO; AND ONTARIO MUNICIPAL WATER ASSOCIATION.
For primary bibliographic entry see Field 5F.
W76-11249

PROCEEDINGS OF THE THIRD NATIONAL CONFERENCE ON COMPLETE WATERUSE: SYMBIOSIS AS A MEANS OF ABATEMENT FOR MULTI-MEDIA POLLUTION,
For primary bibliographic entry see Field 5D.
W76-11257

PRELIMINARY INVESTIGATIONS OF A HEADWATER CREEK IN EASTERN KENTUCKY,
Virginia Commonwealth Univ., Richmond. Dept. of Biology.
G. L. Samsel, Jr., J. R. Reed, and R. R. Daub.
Trans Ky Acad Sci. 34(1/2); p 13-21, 1973.

Descriptors: *Kentucky, *Streams, Algae, Fish, *Baseline data collections, *Erosion, Sedimentation, Primary productivity, *Pre-impoundment, Recreation, Water quality, Nutrients.
Identifiers: *Rich Creek(Kent).

Investigations of a headwater stream, Rich Creek, in south-central Lawrence County, Kentucky, were initiated to ascertain the feasibility of impounding this water for construction of an environmentally controlled recreational reservoir. In addition, baseline data were gathered to facilitate studies on effects of sedimentation and erosion. Data collected on physical and chemical parameters, algae, fish, and bottom fauna, as well as primary productivity, indicated that Rich Creek was an undisturbed, headwater stream. Floral and fauna composition and relative abundance indicated good water quality. Nutrient values and primary productivity were low, and in general all parameters analyzed were indicative of a moderate flow, clean, headwater stream which would provide good quality water for a recreational impoundment.--Copyright 1974, Biological Abstracts, Inc.
W76-11284

CHLORIDE BUILD-UP AND CONTROL IN LAKE ERIE,
State Univ. of New York at Buffalo.
For primary bibliographic entry see Field 5B.
W76-11318

FEASIBILITY OF CHLORINATING FEEDLOT RUNOFF TO MEET BACTERIAL WATER QUALITY STANDARDS,
Maryland Univ., College Park. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5D.
W76-11334

EFFECTS OF WATER QUALITY ON THE RECREATIONAL USE OF WATER IN SOUTH EAST TEXAS,
Lamar Univ., Beaumont, Tex. Dept. of Industrial Engineering.
J. J. Brennan, G. Gates, and C. Carruth.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-256 585, $4.50 in paper copy, $3.00 in microfiche. Completion Report, July, 1976, 58 p, 5 fig, 19 tab. 27 ref. 2 append. OWRT B-195-TEX(1), 14-31-001-5118.

Descriptors: *Recreation, Swimming, Water quality, Estuarine environment, *Attitudes, Water skiing, Gulf of Mexico, *Texas, Cities, Water quality standards, *Water sports(Tex).
Identifiers: *Neches River(Tex), Beaumont-Port Arthur-Orange(Tex), Sabine Lake(Tex).

The estuarine segment of the Neches River in South East Texas flows through the middle of a metropolitan area. It is under-utilized for direct contact, water-based recreation. A public opinion poll of the general populus revealed that 66% participated in swimming and/or skiing in lakes and streams in the region, however only 45% of those had so used the Neches in the recent past. Of those who had used the Neches, 50% said they would not do so again. Reason for these attitudes are explored and compared to measured water quality parameters. Another survey of people actually using the river was made. Their responses and attitudes were compared to measured water quality parameter. Effects of historical, well-founded prejudices and media reports of recent violations on attitudes are discussed.
W76-11335

THE IMPACT OF VACATION HOMES ON NATIONAL FOREST WATER RESOURCES,
Arizona State Univ., Tempe. Coll. of Engineering Sciences.
B. A. Segall.
Eisenhower Consortium Bulletin, No. 3, 19 p, April, 1976. 4 fig, 12 ref, 9 tab.

Descriptors: *Recreation wastes, *Forests, Water resources, *Sewage effluents, *Water quality, Water pollution sources, Wastes, *Arizona, Waste water disposal, Waste water treatment, Water pollution control, Sewerage, Soil disposal fields, Environmental effects, *National Forests.

Wastewater disposal studies in northern Arizona were undertaken to determine the impact of second homes and related vacation development on streams in semiarid regions. The investigation showed that sewage flow rates are dependent upon home occupancy and fluctuate widely in comparison with suburban and urban areas. This sporadic waste discharge is deleterious to package type treatment plant systems. Dispersed well-designed and maintained soil disposal systems are preferred in a forest environment. Conventional sewerage systems and treatment plants concentrate wastewater flows, partially treat waste materials, and are less desirable. (Witt-IPC)
W76-11366

STATUS OF THE NPDES (NATIONAL POLLU... TANT DISCHARGE ELIMINATION SYSTE... IN THE SOUTHEAST,
Environmental Protection Agency, Atlanta, G... Region IV
P. J. Traina
In: TAPPI Environmental Conference, Atlan... Georgia, April 26-28, 1976. Preprinted Proceedi... (TAPPI, Atlanta, Georgia), p 5-8

Descriptors: *Pulp and paper industry, *Southea... U.S., *Federal Water Pollution Control Act, Reg... lation, Legislation, Water Quality Act, *Wat... pollution control, Permits, Water quality contr... *Water quality standards, *Pulp wastes
Identifiers: *National Pollutant Discha... Elimination System(NPDES)

The 1972 Amendments to the Federal Water Pol... tion Control Act established the National Pollut... Discharge Elimination System (NPDES) to be ... ministered by the U.S. Environmental Protecti... Agency. This national permit program is desig... to control the discharge of all pollutants into ... nation's waters. It establishes a tight regulato... system with precise and detailed abatem... requirements, enforcement procedures, and pe... ties for violation. The mechanisms by wh... NPDES discharge permits are issued and ... determining compliance are described. In ... southeastern EPA regional area (which covers ... 8-State region of Alabama, Florida, Georgia, K... tucky, Mississippi, North Carolina, So... Carolina, and Tennessee), compliance w... NPDES permits among the pulp and paper ind... try is exceptionally high. Some 95% of the m... are in compliance with their schedules, and so... 80% are in compliance with their discharge lim... as set forth in the 1977 requirements of the Wa... Pollution Control Act. (Witt-IPC)
W76-11371

POLLUTION MANAGEMENT IN THE PAP... AND PAPERBOARD INDUSTRY.
Paper, Vol. 184, No. 12, p 730-731, 733, Decem... 22, 1975. 1 fig.

Descriptors: *Pulp and paper industry, *Pollu... abatement, Water pollution sources, Surv... Planning, Economics, Operating costs, Opera... and maintenance, Waste water treatment, Co... Foreign countries, Europe.
Identifiers: *Closed systems, England.

The results of a 4-year survey of closed paper... board machine systems by the Environmental P... tection Unit of the Research Association for ... Paper and Board, Printing and Packaging In... tries (England) are presented. During its invest... tion, the association assisted several mills in ... planning and in the implementation of clo... systems. Typical problems likely to be faced ... mills in closing up a system are considered, ... the economics of saveall operation and effl... treatment are discussed briefly. (Witt-IPC)
W76-11400

AGRICULTURE AND CLEAN WATE... PROCEEDINGS OF A CONFERENCE TO ... PLORE CONTROL STRATEGY FOR AGRIC... TURAL NONPOINT SOURCE WATER POL... TION.
Report EPA 600/9-75-005, August 1975. ... ference held in Kansas City, Missouri, Apr... 1975, 153 p. Sponsored by Midwest Researc... stitute and Environmental Protection Agency.

Descriptors: *Water pollution control, *W... quality, *Legal aspects, Farm wastes, Sedim... control, Soil conservation, Erosion, Plans... Agricultural runoff.
Identifiers: *Nonpoint source pollution, F... nutrients, Control planning.

The conference was held to promote a const... tive dialogue on the development of plans fo...

rol of agriculture related nonpoint source pol-
n arising from sediment erosion, fertilizer ru-
livestock wastes and pesticide residues. The
ing session was devoted to an analysis of the
of the art on nonpoint source pollution re-
to agriculture with presentations on: (1) re-
l aspects and viewpoints; (2) agricultural pol-
n control; (3) technical basis of control; (4)
rvation districts; (5) soil conservation; and
ant nutrients. The luncheon session was con-
d with an economic overview, consisting of
dress on economic problems and opportuni-
f pollution control. The afternoon session
esigned to explore elements of control strate-
anning for nonpoint pollution from agricul-
sources with papers on: (1) the states' role;
e state's approach; and (3) the role of the
r and agribusiness. The afternoon session
concluded with a panel discussion on the
opment of a practicable agricultural pollution
ol plan. Over 175 individuals from 20 states
senting local, state, regional, and federal
ltural and environmental agencies attended
nference. Also, included in the 75 different
izations represented at the conference were
ees from farmer associations, educational
tions, and agribusiness. (See also W76-11407
76-11408) (East Central)
1406

**ES ROLE IN FORMULATING CONTROL
TEGY,**
s State Board of Health, Topeka. Div. of
nmental Health.
Metzler.
eport EPA 600/9-75-005, August 1975.
lture and Clean Water--Proceedings of a
rence to Explore Control Strategy for
ltural Nonpoint Source Water Pollution,
s City, Missouri, April 3, 1975, p. 83-92.

ptors: *Sediments, *Water pollution con-
griculture, Nitrogen, *Kansas, *Coliforms,
wastes, Water quality standards.
iers: Fecal coliforms.

Kansas area, the problem of controlling
tural pollution is caused by too much sedi-
nd too much nitrogen. In order to develop a
y which is rational in controlling the pollu-
e should ask--does it affect human health,
eded because it affects human health, is it
because it improves the quality of fish or
, or is it needed in order to control algal
or the growths of weeds. Every river basin
rent and different control strategies are
d. Most of the time, all the major streams
Kansas are in compliance with the stan-
hich Kansas has adopted and which are a
he standards filed with EPA. The total dis-
olids concentration and the fecal coliform
represent the areas of most frequent viola-
cal coliform violations occur usually as a
rainfall and excessive runoff or snowmelt
accompanying runoff. The fecal coliform
was violated approximatey 25 percent of
directly as a result of nonpoint source ru-
e fecal coliform effluent limitation for
domestic wastewater discharges is 200
iform per 100 ml, and this is an extremely
limit; few wastewater discharges in Kan-
meet it. However, at low stream flow, the
iform standards of 400/100 ml in Class A
nd 2,000/100 ml in Class A waters and
ml in Class B waters are rarely violated.
tion to the control problem requires care-
ning a rational approach, and a major
commitment on the part of the agricul-
ustry, and government. (See also W76-
ameron-East Central)
08

MNION OXYGENATION,
rbide Corp., New York. (Assignee).
st, W. E. Grunert, and J. J. Pietruszewski.
U.S. Patent No. 3,956,124, 8 p, 4 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 946, No 2, p 730, May 11, 1976.

Descriptors: *Patents, *Water treatment, *Hypolimnion, *Stratification, *Oxygenation, *Thermal stratification, Lakes, Bottom water, Water pressure, Equipment, Conduits, Impoundments.

A lake or impoundment may be sufficiently deep to stratify thermally during the warm season of the year as the surface layers of water rise in temperature. Due to a relatively high biological oxygen demand, the dissolved oxygen level in the hypolimnion drops to a low level unfavorable to the ecology of the body of water. Whereas the DO deficiency is caused by the high biological oxygen demand, its development and persistence is dependent upon natural thermal stratification which in effect isolates the bottom water from the source of atmospheric oxygen at the surface. It is usually desirable to preserve thermal stratification in lakes and reservoirs. This invention relates to a process for oxygenating the hypolimnion of thermally stratified water bodies with high purity oxygen gas, using side stream pumping, without destroying the thermal stratification. In the process water is withdrawn from the hypolimnion at a rate of 10-200 percent of the hypolimnion volume per month, pressurizing the withdrawn water to superatmospheric pressure below 125 psig, injecting at least 80 percent oxygen gas at a rate of 5-300 lbs. 02 per million pounds withdrawn water but less than a rate to result in 02 supersaturation at the remixing point, returning the mixture through conduit means and remixing it at a rate to produce specified frictional head loss. (Sinha-OEIS)
W76-11454

DOCUMENTATION FOR ES001. A STEADY-STATE, ONE DIMENSIONAL, ESTUARINE WATER QUALITY MODEL,
Environmental Protection Agency, New York. Region II.
For primary bibliographic entry see Field 5B.
W76-11460

PROCEEDINGS OF THE SYMPOSIUM ON OFFSHORE OIL POTENTIAL AND RELATED LAND USE IMPACTS IN THE CENTRAL CALIFORNIA COASTAL ZONE.
California Univ., Santa Cruz, Coastal Marine Lab.
For primary bibliographic entry see Field 6G.
W76-11461

TEXAS COASTAL MANAGEMENT PROGRAM. HEARING DRAFT. EXECUTIVE SUMMARY.
Texas General Land Office, Austin.
For primary bibliographic entry see Field 6B.
W76-11465

TEXAS COASTAL MANAGEMENT PROGRAM. HEARING DRAFT.
Texas General Land Office, Austin.
For primary bibliographic entry see Field 6B.
W76-11466

TEXAS COASTAL MANAGEMENT PROGRAM. HEARING DRAFT. APPENDICES.
Texas General Land Office, Austin.
For primary bibliographic entry see Field 6B.
W76-11467

FLORIDA COASTAL POLICY STUDY: THE IMPACT OF OFFSHORE OIL DEVELOPMENT,
Florida State Univ., Tallahassee. Dept. of Urban and Regional Planning.
For primary bibliographic entry see Field 6G.
W76-11468

INTRODUCTION,
Florida State Univ., Tallahassee. Dept. of Urban and Regional Planning.
For primary bibliographic entry see Field 6G.
W76-11469

BUREAU OF LAND MANAGEMENT'S ENVIRONMENTAL STUDIES PROGRAM FOR THE SOUTH ATLANTIC OUTER CONTINENTAL SHELF AREA. CONFERENCE/WORKSHOP PROCEEDINGS,
Research Triangle Inst., Research Triangle Park, N. C.
For primary bibliographic entry see Field 6G.
W76-11474

FRAMEWORK FOR BUREAU OF LAND MANAGEMENT PROGRAMS,
Bureau of Land Management, Washington, D.C. Outer Continental Shelf Environmental Studies Program.
For primary bibliographic entry see Field 6G.
W76-11476

THE ALASKAN OUTER CONTINENTAL SHELF ENVIRONMENTAL ASSESSMENT PROGRAM,
National Oceanic and Atmospheric Administration, Boulder, Colo. Outer Continental Shelf Environmental Assessment Program.
For primary bibliographic entry see Field 6G.
W76-11478

ENVIRONMENTAL PROTECTION AGENCY'S ROLE, INTERESTS, AND RESPONSIBILITIES WITH RESPECT TO THE OUTER CONTINENTAL SHELF DEVELOPMENT,
Environmental Protection Agency, Johns Island, S. C. Office of Research and Development.
For primary bibliographic entry see Field 6G.
W76-11479

OFFSHORE OPERATIONS, REGULATION AND ENVIRONMENTAL PROTECTION,
Exxon Co., New Orleans, La. Southeastern Div.
For primary bibliographic entry see Field 6G.
W76-11480

OVERVIEW OF CONFERENCE PROGRAMS,
Skidaway Inst. of Oceanography, Savannah, Ga.
For primary bibliographic entry see Field 6G.
W76-11481

CONCLUSION AND RECOMMENDATIONS CONFERENCE/WORKSHOP,
Skidaway Inst. of Oceanography, Savannah, Ga.
For primary bibliographic entry see Field 6G.
W76-11485

HYGIENIC EVALUATION OF AN EPOXY COMPOUND AND THE POSSIBILITY OF ITS USE IN SUBMERSIBLE ELECTRIC PUMPS FOR DOMESTIC PURPOSES, (IN RUSSIAN),
Kiev Research Inst. of General Communal Hygiene (USSR).
For primary bibliographic entry see Field 5C.
W76-11528

THE IMPORTANCE OF INHIBITING SUBSTANCES IN THE CONTROL OF ALGAL AND BACTERIAL POPULATIONS OF MARINE PLANKTON, (IN FRENCH),
Centre d'Oceanographie, Marseille (France). Station Marine d'Endoume.
B. R. Berland, D. J. Bonin, and S. Y. Maestrini.
Mem Biol Mar Oceanogr. 4(3), p 63-100, 1974.

Descriptors: *Bacteria, Inhibition, Plankton, Algae, Biocontrol, *Algal control, Reviews, Sea water, Marine animals.

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Identifiers: *Telluric bacteria.

The literature on inhibiting extracellular substances produced by marine algae and bacteria is reviewed, with a view to ascertaining their importance in the control of natural populations. Numerous planktonic species are able to produce these substances, but none of the data reported, including those obtained with chemically purified substances, indicate that they play an important role. The significance of antibiosis seems in fact to be over-rated. The antibacterial activity of sea water against telluric bacteria carried to the sea by rainfalls or sewage should be considered as 1st resulting from inimical heavy metals ion activity and from their lack of ability to take up the organic substrates, because of their very low concentration in sea water. Thus, telluric bacteria are unable not only to compete with natural marine bacteria, but also to survive for a long time. The substances released by plankton, especially by algae, are taken up only by marine bacterial strains, which prevent their accumulation so that telluric bacteria usually remain starved. Marine algae and bacteria seem to be rarely inhibited by antagonistic metabolites, because the cell densities are not high enough to release the necessary quantities for an activity level. Grazing and competition for nutrients are the most important factors in controlling algal and bacterial populations.--Copyright 1975, Biological Abstracts, Inc.
W76-11542

POSSIBILITY OF USING PHENOLIC RESINS IN HOUSEHOLD AND DRINKING WATER SUPPLY SYSTEMS, (IN RUSSIAN),
Vsesoyunznyi Nauchno-Issledovatelskii Institut Gigieni i Toksikologii Pestitsidov, Kiev (USSR).
For primary bibliographic entry see Field 5C.
W76-11560

HYGIENIC PROBLEMS OF LARGE ANIMAL CONFINEMENT,
Universitaet Hohenheim (Landwirtschaftliche Hochschule). (West Germany). Animal Health Dept. (I).
D. Strauch.
Zentralbl Bakteriol Parasitenkd Infektionskr Hyg Erste Abt Orig Reihe B Hyg Praev Med 159(4), p 409-423, 1974.

Descriptors: *Farm wastes, *Confinement pens, *Public health, *Human diseases, Fertilizers, Microorganisms, *Bacteria, Water pollution control, Waste disposal, Legal aspects, Disinfection, Odor.
Identifiers: Antibiotics.

Keeping animals in large confinements creates special problems in epidemiology of infectious diseases and environmental protection. Epidemiologicl questions are closely connected with the excrements of animals. Chemical disinfection of physical treatment of animal manure can help to prevent spread of infectious microorganisms by using the excrements as fertilizer. The odor nuisances caused by the manure are linked to the use of too large amounts of slurry on agricultural fields by which damage is done to the soil and the plants. Hygienic problems are also created by feeding antibiotics to animals which may cause infectious resistance in various types of bacteria. The influence of untreated effluents on the receiving surface waters or ground waters must be considered from the point of view of water pollution. The same is true for the hygienic disposal of animal carcasses or parts of them in an adequate system of rendering plants. Governmental authorities are, by legislation, trying to get the nuisances of the environment caused by large animal confinement units under control.--Copyright 1976, Biological Abstracts, Inc.
W76-11571

MERCURY IN LAUNDRY WASTEWATERS,
Illinois Inst. for Environmental Quality, Chicago.
For primary bibliographic entry see Field 5D.
W76-11602

REVIEW OF STANDARDS AND OTHER INFORMATION ON THERMOPLASTIC PIPING IN RESIDENTIAL PLUMBING,
National Bureau of Standards Washington, D. C
For primary bibliographic entry see Field 8G.
W76-11603

DATA MANAGEMENT: KEY TO ENVIRONMENTAL QUALITY ASSESSMENT,
National Oceanic and Atmospheric Administration, Washington, D. C. Environmental Data Service.
T. S. Austin.
In: International Conference on Environmental Sensing and Assessment, Vol. 2, September 14-19, 1975, Las Vegas, Nevada, p 25-1-1 - 25-1-4. 1 ref.

Descriptors: *Data collections, *Data processing, *Data transmission, *Information exchange, *Information retrieval, *Monitoring, Programs, Measurement, *Pollutant identification, Remote sensing, Methodology.

An evolving generic concept for an integrated data management system designed for investigating pollution of the marine environment is outlined. The concept incorporates knowledge and experience gained in large-scale, interdisciplinary data collection and interpretation programs such as the Barbados Oceanographic and Meteorological Experiment, the International Field Year for the Great Lakes program, American programs during the International Decade of Ocean Exploration, the Atlantic Tropical Experiment of the Global Atmospheric Research Program, and the development of a National Oceanic and Atmospheric Administration environmental quality monitoring plan for proposed oil and gas activities on the United States Continental Shelf. An international marine pollution monitoring pilot project known as the Integrated Global Ocean Station System is also described. The project involves a cooperative system for the unrestricted international exchange of ocean data, information, and services. Data are collected by 78 participating countries and are transmitted to users through the Global Telecommunication System. The rapidly developing role of remote sensing via satellite is also discussed. (See also W76-10637) (Kreager-FIRL)
W76-11607

A PRACTICAL DATA MANAGEMENT SYSTEM FOR MONITORING AND MANAGING LARGE DISTRIBUTED ECOSYSTEMS,
Michigan State Univ., East Lansing. Dept. of Electrical Engineering and Systems Science.
P. D. Fisher, and J. R. Cruitt.
In: International Conference on Environmental Sensing and Assessment, Vol. 2, September 14-19, 1975, Las Vegas, Nevada, p 25-5-1 - 25-5-6. 2 fig, 2 tab, 5 ref.

Descriptors: *Data collections, *Data processing, *Information retrieval, *Monitoring, *Watershed management, Computers, Water quality control, Methodology, Pollutant identification, *Ecosystems.

A data management system which has many of the operational characteristics of the Environmental Protection Agency's Water Quality Control Information System is described for the monitoring and managing of large distributed ecosystems such as major watersheds. Data for the system are organized according to date, location, and parameter menonic. The system presently contains over 200 defined stations and over 1000 defined parameters. Raw data are being routinely put into the system at a rate of more than 250,000 entries/year. The system includes four possible output format options, including a format suitable for insertion into

the Environmental Protection Agency s Wat
Quality Control Information System. Data are o
ganized and temporarily stored on disc and th
periodically moved to magnetic tape. The da
management system is well suited for a mediu
sized computer facility and for the on line manag
ment of ecosystems in which throughput da
delays of not more than 24 hours are required
data collected in situ and 2 weeks for data whi
must pass through analytical laboratories. (S
also W76-10637) (Kreager-FIRL)
W76-11608

THE ROLE OF ENVIRONMENTAL DA BANKS IN ENERGY RESOURCE DEVELO MENT,
Kentucky Univ., Lexington Inst for Mining
Minerals Research
J. E. Jones, and G. E. Smith
In: International Conference on Environme Sensing and Assessment, Vol. 2, September 14- 1975, Las Vegas, Nevada, p 25-6-1 - 25-6-5. 8 13 ref

Descriptors: *Data collections, *Informa retrieval, *Industrial wastes, *Informa exchange, *Pollutant identification, Surf waters, Groundwater, Heat, Heat transfer, E gy conversion, Coals, Kentucky
Identifiers: Coal conversion plants.

The Environmental Data, Information, and Lit ture Bank being developed by the Universit Kentucky for assessing the environmental, so and economic aspects of producing clean from coal is described. The data bank is desi to promote information exchange between related governmental and private projects as energy development community. Environme impacts of interest to the environmental data include those associated with air, water, n and solid waste pollution. Specific data will be lected on surface water and subsurface water tamination and the generation and transfer of to water resources. The data bank is viewed necessary and integral part of the total en development program in Kentucky since each conversion plant will be required to prepare a vironmental impact statement. (See also 10637) (Kreager-FIRL)
W76-11609

SAMPLE TRACKING DATA MANAGEM SYSTEM,
Environmental Monitoring and Support Lab. Vegas, Nev.
For primary bibliographic entry see Field 7C.
W76-11611

QUALITY CONTROL AND HARMONIZA PROGRAMMES FOR THE ASSESSMENT EFFECTS AND THE MEASUREMENT O VIRONMENTAL POLLUTION IN THE ROPEAN COMMUNITIES,
Commission of the European Communities, embourg. Health Protection Directorate.
P. Recht, J. Smeets, R. Amavis, and A. Berlin
In: International Conference Environm Sensing and Assessment, Vol. 2, September 1975, Las Vegas, Nevada, p 36-1-1 - 36-1-4. 4

Descriptors: *Quality control, *Water q *Europe, *Program, *Analytical techniques, surement, Evaluation, Surface waters, P water, Pollutant identification, Phenols, Sam Microbiology, Chemical properties, Phenols.
Identifiers: Collaborative testing.

Quality control and comparative programs with the measurement of environmental po throughout the European Communities discussed. Currently about 450 analytical lab ries are involved in 20 programs involving laborative testing of different ana procedures. A collaborative study on the

ssessment of surface water quality has been
ted to compare the methods of sampling,
sis, and data assessment used by individual
atories in member states and to aid in
lishing possible reference methods. Programs
lso being conducted to standardize measure-
s of microbiological and chemical parameters
nking water and to develop reliable methods
ie determination of cyanides, phenols, and
carbons in surface water. (See also W76-
) (Kreager-FIRL)
11613

DATION OF ENVIRONMENTAL MEA-
MENT METHODOLOGY,
onmental Monitoring and Support Lab., Cin-
i, Ohio.
imary bibliographic entry see Field 5A.
1614

NDWATER SUPPLIES OF THE
TAL REGION,
imary bibliographic entry see Field 5F.
1618

DISCOVERS THE COASTAL ENVIRON-
: A FOOTPRINT IN THE SAND,
Carolina State Univ. at Raleigh. University
s.
mary bibliographic entry see Field 5D.
1621

THE WATER, THEN THE SEWER,
LAND USE PLANNING: COASTAL
ING IN RETROSPECT AND IN THE

Carolina State Planning Div., Raleigh.
nary bibliographic entry see Field 5D.
622

OMIC IMPLICATIONS OF COASTAL
DISPOSAL ALTERNATIVES,
Univ., Athens. Inst. of Natural
es.
nary bibliographic entry see Field 5E.
523

ATER RESOURCES ANNING

echniques Of Planning

NAL POLLUTION ANALYSIS FOR
AGE FORECASTS,
Univ., Ithaca, N. Y. Center for Urban
ment Research.
ary bibliographic entry see Field 5G.
27

RIX APPROACH FOR DETERMINING
VATER MANAGEMENT IMPACTS,
Roy F.), New York.
ary bibliographic entry see Field 5G.
28

AL RESOLUTION OF ENVIRONMEN-
FLICTS,
Univ. (Ontario). Dept. of Systems

ry bibliographic entry see Field 6G.
9

TIONS BETWEEN LAND USE AND
VATER RESOURCES PLANNING,
niv., Lafayette, Ind. School of Civil En-

ry bibliographic entry see Field 4A.
)

OPTIMIZATION OF WATER DISTRIBUTION NETWORK SYSTEMS,
Weston (Roy F.), Inc., West Chester, Pa.
For primary bibliographic entry see Field 8B.
W76-11133

ESTIMATING FLOW CONDITIONS FOR RIVER MODELS,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 5B.
W76-11136

RESPONSE OF SOUTH PLATTE TO EFFLUENT LIMITATIONS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W76-11137

MULTI-CRITERION RANKING OF ALTERNATIVE LONG-RANGE WATER RESOURCE SYSTEMS,
National Water Authority, Budapest, Hungary. Dept. of Water Management Policy.
For primary bibliographic entry see Field 6B.
W76-11139

DYNAMIC MODELLING AND CONTROL APPLICATIONS IN WATER QUALITY MAINTENANCE,
Cambridge Univ. (England). Dept. of Engineering.
For primary bibliographic entry see Field 5G.
W76-11142

VILLAGE WATER SUPPLY, A WORLD BANK PAPER.
International Bank for Reconstruction and Development, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-11143

A STOCHASTIC PROGRAMMING MODEL APPLIED TO WATER RESOURCES MANAGEMENT,
Computing Center for Universities, Budapest (Hungary).
For primary bibliographic entry see Field 4A.
W76-11144

MULTIPLE OBJECTIVE PLANNING FOR WATER RESOURCES, (VOL I),
Idaho Research Foundation, Inc. Moscow.
For primary bibliographic entry see Field 6B.
W76-11173

MULTIPLE OBJECTIVE PLANNING FOR WATER RESOURCES, (VOLUME II),
Idaho Research Foundation, Inc., Moscow.
For primary bibliographic entry see Field 6B.
W76-11174

SYSTEMATIC DEVELOPMENT OF METHODOLOGIES IN PLANNING URBAN WATER RESOURCES FOR MEDIUM SIZE COMMUNITIES. PHASE I. FINAL REPORT,
Purdue University, West Lafayette, Indiana, Water Resources Research Center.
For primary bibliographic entry see Field 6B.
W76-11175

SYSTEMATIC DEVELOPMENT OF METHODOLOGIES IN PLANNING URBAN WATER RESOURCES FOR MEDIUM SIZE COMMUNITIES: REGIONAL AQUIFER EVALUATION STUDIES WITH STOCHASTIC INPUTS,
Purdue University, West Lafayette, Indiana, Water Resources Research Center.
For primary bibliographic entry see Field 6B.
W76-11176

SYSTEMATIC DEVELOPMENT OF METHODOLOGIES IN PLANNING URBAN WATER RESOURCES FOR MEDIUM SIZE COMMUNITIES: POPULATION CHARACTERISTICS AND RESIDENTIAL WATER USE,
Purdue Univ., Lafayette, Ind. Dept. of Sociology and Anthropology.
For primary bibliographic entry see Field 6B.
W76-11177

WATER QUALITY MANAGEMENT PLANNING FOR URBAN RUNOFF.
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5D.
W76-11600

6B. Evaluation Process

COLLECTED REPRINTS, VOLUME III: 1971-1974,
Hawaii Univ., Honolulu. Water Resources Research Center.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-256 429, $11.75 in paper copy, $3.00 in microfiche. June 1975, 489 p. OWRT A-049-HI(1). 14-31-0001-5011.

Descriptors: Water resources, *Information retrieval, *Information exchange, *Hawaii, Conferences, Publications.

The objective of the Hawaii's Water Resources Information Dissemination project is to make more widely available reprints of professional articles, papers presented at scientific meetings, and reports of a limited circulation by WRRC staff and affiliate members. These studies, which are multidisciplinary in scope, identify, evaluate, assess, and measure the interacting factors that affect water resources in Hawaii. The publication of these specialized articles and papers makes available the results of a broad spectrum of research activity which, though specialized, is interrelated and provides an overall picture and understanding of the direction of current research in Hawaii. (See also W73-02347)
W76-11103

MARGINAL POLLUTION ANALYSIS FOR LONG RAGE FORECASTS,
Cornell Univ., Ithaca, N. Y. Center for Urban Development Research.
For primary bibliographic entry see Field 5G.
W76-11127

LOCAL ATTITUDES AND WATER RESOURCES DEVELOPMENT: A CANADIAN CASE STUDY,
Prince Edward Island, Charlottetown. Dept. of Sociology and Anthropology.
S. Dasgupta.
Water Resources Bulletin, Vol. 12, No. 1, p 27-37, February 1976. 5 tab, 10 ref.

Descriptors: *Water resources development, *Attitudes, River basins, Surveys, Education, *Canada, Social participation.
Identifiers: Public participation, Community residents, Status variables, *Dunk River basin(Canada), Level of living, Organizational participation.

The objective of this paper is to identify the variables which relate independently to attitudes toward water resources development and to determine whether or not these variables have a greater additive effect on attitudes when combined into an index than when considered singly. Six status vari-

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ables, which have been found more or less consistently in previous studies to have relationship with attitudes, are related to attitudes toward Dunk River development. Four variables -- education, occupation, level of living, and organizational participation -- appear to have significant relationships with attitudes in this study. The relationships of length of residence in community and age with attitudes are not significant. The analysis of local attitudes is useful in identifying factors which affect the participation of community residents in water resources development activities, assuming that favorable attitudes are associated with increased participation. (Bell-Cornell)
W76-11132

FEM COUPLED WITH LP FOR WATER POLLUTION CONTROL,
Hiroshima Inst. of Tech., Itsukaichi (Japan).
For primary bibliographic entry see Field 5B.
W76-11134

MULTI-CRITERION RANKING OF ALTERNATIVE LONG-RANGE WATER RESOURCE SYSTEMS,
National Water Authority, Budapest, Hungary. Dept. of Water Management Policy.
L. David, and L. Duckstein.
Water Resources Bulletin, Vol. 12, No. 4, p 731-754, August 1976. 6 fig, 5 tab, 28 ref.

Descriptors: *Water resources, *Systems analysis, *Long-range planning, *Alternative planning, Economics, Water utilization, Methodology, Probability, Consumptive use, Non-consumptive use, Water quality, Evaluation.
Identifiers: *Cost-effectiveness, *Tisza River basin(Hungary), Energy requirements, Sensitivity analysis, System performance.

The definition and comparison of alternative water resource systems designed to meet long-range goals (say 60 years) is illustrated by a case study of the Tisza River Basin in Hungary. A comprehensive cost-effectiveness approach is adapted to define goals, specifications, criteria, and alternatives and their capabilities. Specifications include demands given in probabilistic terms. The comparison of alternative systems is based on 12 criteria, one of which is the balance between total energy consumed and peak energy produced. Important factors involving social elements, such as flood protection and land and forest use, are described both as monetary quantities and as qualitative appreciations. Five alternative systems are defined involving flat land reservoirs, pumped storage reservoirs, interbasin transfer, and conjunctive use of surface and ground water. International cooperation is then used to rank systems and reduce the problem to a tradeoff between only two alternatives. (Bell-Cornell)
W76-11139

COST BENEFIT ANALYSIS AND WATER POLLUTION POLICY.
Urban Inst., Washington, D.C.
For primary bibliographic entry see Field 5G.
W76-11153

THE CONCEPT OF BENEFITS IN COST-BENEFIT ANALYSIS: WITH EMPHASIS ON WATER POLLUTION CONTROL ACTIVITIES,
Wisconsin Univ., Madison. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W76-11154

A SURVEY OF THE TECHNIQUES FOR MEASURING THE BENEFITS OF WATER QUALITY IMPROVEMENT,
Bowdoin Coll. Brunswick, Maine. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W76-11155

SOME INSTITUTIONAL AND CONCEPTUAL THOUGHTS ON THE MEASUREMENT OF INDIRECT AND INTANGIBLE BENEFITS AND COSTS,
Wisconsin Univ., Madison. Dept. of Economics
J. Bishop, and C. Cicchetti.
In: Cost Benefit Analysis and Water Pollution Policy, Environmental Protection Agency and Urban Institute Symposium, September 5-7, 1973, Annapolis, Md. Published in 1975, p. 105-126. 15 ref

Descriptors: *Water pollution control, *Cost benefit analysis, *Project benefits, *Measurement, *Intangible benefits, *Intangible costs, Econometrics, Aesthetics, Evaluation, Social values, Mortality, Psychological aspects, Morbidity.
Identifiers: Option value, Hedonic pricing.

The concepts as to how to include intangible and environmental non-user benefits (such as the valuation of postponing death, indirect benefits of postponing death, the valuation of good health), and the application of the hedonic method to measurement of the private valuation of risk are propounded. It is suggested that the characteristic approach to utility theory be used to give a systematic theoretical basis to methods for using observable market prices to place values on nonmarketed outputs. By viewing the consumer's utility function as defined over a limited number of attributes or consumption activities rather than over an infinite list of unique products, commonalities can be defined between things that are sold in markets and the free or public goods that are not. The trade-offs between money and a characteristic that people exhibit in their private behavior can be used to estimate the implicit price of attributes provided by public projects. The attributes that often appear as intangibles in cost-benefit analysis--risk of early death, pain, loss of personal beauty, option value, congestion, disruption in the use of nonwork time--are discussed and methods for evaluating them monetarily are suggested and evaluated. As intangible benefits are not distributed over project design or program clientele proportionately to the more easily measured benefits, their elimination inevitably distorts the planning process. (See also W76-11153) (Auen-Wisconsin)
W76-11156

A SURVEY OF EMPIRICAL BENEFIT STUDIES,
Environmental Protection Agency, Washington, D.C.
D. Tihansky.
In: Environmental Protection Agency and Urban Institute Symposium, September 5-7, 1973, Annapolis, Md. Published in 1975, p. 127-172. 1 fig., 3 tab., 113 ref.

Descriptors: *Intangible benefits, *Cost-benefit analysis, *Water pollution control, *Methodology, *Estimating, Econometrics, Evaluation, Pricing, Reviews, Water quality standards, Water utilization.

Selected studies contributing most to the conceptual framework and empirical insights of benefit evaluation are reviewed, with less than 30% found theoretically valid; even fewer seem cognizant of the applicability, let alone the existence of welfare economics. The state of the art on benefit studies is outlined and the empirical findings contrasted. The criteria for judging the adequacy or relevance of benefit assessment are prescribed, the literature evaluated according to these criteria, and the utility of translating all benefits into precise monetary values analyzed. An Appendix examines selected references for methodological weaknesses and reviews empirical estimates with emphasis on their adaptability to local and regional planning. Extensive comments on the references are contained in the Appendix, where the studies are partioned according to their focus on a specific pollutant, a particular water use, or a more comprehensive analysis. The Appendix concentrates on the [illegible] application or misinterpretation of theoretical empirical notions, i.e., having chosen methodology for benefit estimation, the empir next faces problems of gathering relevant d formulating reliable damage relations from data, and then interpreting them in a pr economic perspective. A multidisciplin framework of analysis, as implemented succ fully in regional planning, is recommended a most viable alternative to benefit analysis (See also W76-11153) (Auen-Wisconsin)
W76-11157

COSTS OF WATER QUALITY IMPRO MENT, TRANSFER FUNCTIONS, AND PU POLICY,
Resources for the Future, Washington, D.C.
For primary bibliographic entry see Field 5G.
W76-11158

VALUING LONG-RUN ECOLOGICAL C SEQUENCES AND IRREVERSIBILITIES,
Maryland Univ., College Park. Dept. Economics.
For primary bibliographic entry see Field 6G.
W76-11161

COST-BENEFIT ANALYSIS, PROPE RIGHT SPECIFICATION 'DISTRIBUTION',
Rand Corp., Santa Monica, Calif.
J. A. Stockfisch.
In: Cost Benefit Analysis and Water Pollutio icy, Environmental Protection Agency and Institute Symposium, September 5-7, 1973 napolis, Md. Published in 1975, p. 313-331. 12

Descriptors: *Cost-benefit analysis, *Resou location, *Legal aspects, *Pollution abate Decision making, Theoretical analysis, Pr aspects, Law enforcement, Social value, M tion, Welfare(Economics).
Identifiers: *Property rights, Common pro Externalities, Incentive.

The concept of 'property rights'--that 'i scheme of relationships between individual respect to an object' and the idea of 'excl precede the discussion of the property rig proach in cost-benefit analysis. The struct property rights both constrains and motivate ple with respect to the use of scarce comm and services; thus it impacts on the utilitie vided by various outputs and hence on relat mands and resource allocation. Changes in l the content of property rights cannot help fect the distribution of resource earnings, and welfare, hence both relative prices an observed in the economy are functions of th and political systems. Environmental qual provements can generally be implemented public realm by either constraining pr behavior by law; or by undertaking resource-using projects or activities. Cha the law and outputs of government project income distribution and the relative pri resources and other inputs--and through thi can change government program costs--the on costs will be in the future. This as general interdependence, however, would used to reject existing prices as appropria sures of program or project costs. (See als 11153) (Auen-Wisconsin)
W76-11162

PROJECT-BY-PROJECT ANALYSIS VS. PREHENSIVE PLANNING,
Environmental Protection Agency, Wash D.C.
For primary bibliographic entry see Field 5
W76-11163

ST-BENEFIT ANALYSES OF COST-
EFIT ANALYSIS,
fornia Univ., Riverside. Dept. of Economics.
. Crocker.
Cost Benefit Analysis and Water Pollution Pol-
Environmental Protection Agency and Urban
tute Symposium, September 5-7, 1973, An-
lis, Md. Published in 1975, p. 341-359. 9 ref.

riptors: *Data collections, *Cost-benefit anal-
*Decision making, *Pollution abatement,
ifications, Measurement, Correlation analy-
Heterogeneity, Methodology.

neral model is used as a framework for deci-
about information and is designed to be ap-
ble to a wide variety of informational systems
real world circumstances including cost-
it analysis of water pollution activities. The
l is viewed as a vehicle for tools rather than
instrument capable of direct empirical appli-
. Minimally, itcan make those who must de-
bout information structures aware of the na-
f the relations among relevantvariables, in-
g those variables that are important for nor-
e purposes. The model is helpful in identify-
e general elements of the information evalua-
decision problems, but unless greater
icity is introduced, it is incapable of indicat-
ether an information assessor should regard
cture as good or bad. Qualitative criteria is
ed for this decision problem and some fac-
ointed out that might influence the relative
nd benefits of alternative information struc-
Considered are the factors that influence the
nd benefits of cost-benefit analysis for the
n maker when information assessors and
n makers have incompatible perceptions of
lity of different acts and probabilities of
results, and the problem of evaluating al-
ve ways of motivating the assessor to max-
ne decision maker's own effectiveness, and
make prior and retrospective evaluations
assessor's performance. (See also W76-
Auen-Wisconsin)
164

OLE OF COST-BENEFIT ANALYSIS IN
Y MAKING,
d Univ., Calif.
en.
Benefit Analysis and Water Pollution Pol-
vironmental Protection Agency and Urban
Symposium, September 5-7, 1973, An-
Md. Published in 1975, p. 361-370. 3 ref.

ors: *Cost-benefit analysis, *Decision
Methodology, Social aspects, Federal
olicy, Water quality standards.
rs: *Policy making, *Policy evaluation.

ne predominant concept of cost-benefit
is as a method for making choices, i.e., a
rule which enables selection of the most
of several alternative courses of action,
role of cost-benefit analysis as a con-
to the decision processes by assisting in
ulation of objective and of alternative ac-
vell as contributing to the process of cho-
en them is discussed. Cost-benefit analy-
decision process is based on the premise
jectives and alternatives must be
d, designed, and invented. In this defini-
-benefit analysis can provide a concep-
ture and a set of techniques for relating
ends, for arraying the various costs as-
with each course of action, and for
, comparing, and assessing possible out-
may be able to express something about
people attach to various outputs. It can
test the sensitivity of alternatives to dif-
ntingencies. A competent cost-benefit
very useful in constructing and assem-
s, facts, and relationships. The concept
ost) and output (benefit) provides an ex-
eful framework for organizing pertinent
relationships in dealing with policy

problems. It can reveal social cost, equipable compensation, and resolve the problem in specifying the relationship between inputs of resources and outputs (production functions). (See also W76-11153) (Auen-Wisconsin)
W76-11165

VOTING, COST-BENEFIT ANALYSIS, AND WATER POLLUTION POLICY,
Resources for the Future, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-11166

THE REDISTRIBUTIONAL CONSEQUENCES OF PUBLIC RECREATION PROVISION AT THE POTHOLES RESERVOIR--COLUMBIA BASIN PROJECT, WASHINGTON,
Washington State Univ., Pullman. Dept. of Agricultural Economics.
K. C. Scott, and C. D. Ditwiler.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-256 577, $5.50 in paper copy, $3.00 in microfiche. Washington Water Research Center, Pullman, Report No. 25, May 1976. 101 p, 3 fig, 41 tab. 58 ref, 3 append. OWRT A-066-WASH (2). 14-31-0001-5048.

Descriptors: *Recreation, *Washington, Reservoirs, *Benefits, *Estimated costs, Human population, Cost analysis, *Recreation demand, Distribution patterns, Social aspects, Economics.
Identifiers: Public costs, *Potholes Reservoir(Wash), *Columbia Basin Project(Wash).

The purpose was to identify the redistributional consequences of the public recreation provision at the Potholes Reservoir. The Potholes Reservoir serves as a small storage reservoir within the Bureau of Reclamation's Columbia Basin Project. Although the reservoir was originally constructed for irrigation purposes, it receives extensive recreational use by recreationists from all parts of the state of Washington. State and local governments have provided a majority of the funds for the recreational facilities at the reservoir as well as usual operation and maintenance costs. Benefits were assigned to relevant socio-economic classifications of recreationists based on the results of a recreation survey wherein 2,650 recreational parties were interviewed. Estimates of the public costs of providing and maintaining outdoor recreation opportunity at the reservoir were obtained from federal and state agencies administering public recreation in the area. The final incidence of these public costs were assigned to income classes, and subsequently to geographical areas and age groups according to the estimated tax incidence effect of the public sector in the state. The recreationists receiving positive redistributional impacts were the lower classes ($0-7,500 annual income), the young (under 25 years of age), the elderly (over 55 years of age), and the recreationists residing in the geographical areas adjacent to the reservoir area.
W76-11168

MULTIPLE OBJECTIVE PLANNING FOR WATER RESOURCES, (VOL I),
Idaho Research Foundation, Inc. Moscow.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-256 739, $4.50 in paper copy, $3.00 in microfiche. Proceedings of the UCOWR Workshop on Multiple Objective Planning and Decision-making, Las Vegas, Nevada, July 16-18, 1974. Natural Resources Series No. 5, 1974. 63 p, 17 ref. E. L. Michalson, A. E. Englebert, Wade Andrews (eds.). OWRT X-142(No. 4259)(1).

Descriptors: Water resources, Planning, *Alternative planning, *Comprehensive planning, *Decision making, Economic efficiecy, Methodology, Programs, River basin development, *Multiple-purpose projects, Water resources development, *Conferences, Information exchange.
Identifiers: *Multiple Objective Planning.

The workshop originated as an effort on the part of the Committee for Education and Research in the Social Sciences of the Universities Council on Water Resources. During the 1972 UCOWR annual meeting a task force was established to identify research topics and problems related to multiple objective planning and decision making; during the 1973 UCOWR meeting it was decided to have the workshop. The workshop itself was designed to provide a means of exchange between federal agency planners and university researchers. Agency planners -- through position papers -- provided basic input to use in multiple objective planning. (See also W76-11174)
W76-11173

MULTIPLE OBJECTIVE PLANNING FOR WATER RESOURCES, (VOLUME II),
Idaho Research Foundation, Inc., Moscow.
Proceedings of the UCOWR Conference on Multiple Objective Planning and Decision Making, Boise Idaho January 14-16, 1975 Natural Resources Series No. 5, 1975. 122 p, 153 ref, C. R. Stratton E. L. Michalson, A. E. Engelbert, Wade Andrews (eds.) tech ed. OWRT X-142(No. 4259) (2).

Descriptors: Water resources, Planning, *Decision making, Social Impact, Environmental effects, Methodology, *Alternative planning, *Conferences, Cost-benefit analysis, *Comprehensive planning, Information exchange.
Identifiers: *Multiple Objectives Planning.

The conference discussed was a result of efforts by the Committee for Education Research in the Social Sciences of the Universities Council on Water Resources. During the 1972 UCOWR annual meeting, a task group was established to identify research topics and problems related to multiple objective planning and decision making. At the 1973 UCOWR annual meeting, a resolution was passed calling for a national Workshop-Conference on the topic. The Conference was designed to allow the university people to present their ideas for public discussion by federal agency planners. The Workshop papers were presented in Volume 1, the present volume contains the Conference papers, together with summaries of the discussion and panels. (See also W76-11173)
W76-11174

SYSTEMATIC DEVELOPMENT OF METHODOLOGIES IN PLANNING URBAN WATER RESOURCES FOR MEDIUM SIZE COMMUNITIES. PHASE I. FINAL REPORT,
Purdue University, West Lafayette, Indiana, Water Resources Research Center.
J. W. Delleur, J. M. Bell, L. Z. Breen, W. N. Melhorn, and W. L. Miller.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-256 565, $5.00 in paper copy, $3.00 in microfiche. Technical Report No. 74, April 1976, 71 p, 17 fig, 18 tab. OWRT C-3277(No 3713) (12).

Descriptors: *City planning, *Urban drainage, *Social aspects, *Economics, *Land use, *Urban hydrology, *Ground water, Drainage systems, Urban runoff, Urbanization, Storm drains, Groundwater movement, Water pollution, Population, Distribution patterns, *Indiana, Oklahoma, Illinois.
Identifiers: *Demographic studies.

The interdisciplinary study for planning urban water resources development gives models for estimating population growth, water demand, quantity and quality of surface runoff, and availability of ground water for communities in the 100,000 to 200,000 population range. These models were extended for a 25 to 30 year period. The test area was principally the Lafayette and West Lafayette, Indiana area. Additional sites in Indi-

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ana, Oklahoma, and Illinois were used for specific purposes. Life tables were developed for the area and a regression equation proposed which relates water consumption to size and value of houses, rental values and population age distribution. A procedure for developing aquifer maps is presented as well as a ground water model which responded to different pumping stresses. Deterministic and stochastic models of the lumped non-linear type are presented which portray the rainfall-runoff process and appropriately quantify the effects of urbanization on runoff. For the water quality model, suspended solids and BOD are utilized, and if possible to obtain, total and fecal coliform counts, total solids, COD, and phosphorus data. Alternative methods of surface drainage were considered and comparisons made of the benefit-cost relationship of providing the various drainage systems before urbanization has begun and after it is completed. (See W76-11176 and W76-11177)
W76-11175

SYSTEMATIC DEVELOPMENT OF METHODOLOGIES IN PLANNING URBAN WATER RESOURCES FOR MEDIUM SIZE COMMUNITIES: REGIONAL AQUIFER EVALUATION STUDIES WITH STOCHASTIC INPUTS,
Purdue University, West Lafayette, Indiana, Water Resources Research Center.
Bathala, T. Chenchayya, J. A. Spooner, Rao, and A. Ramachandra.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-256 564, $5.00 in paper copy, $3.00 in microfiche. Technical Report No. 72, February 1976. 83 p, 40 fig, 17 tab, 52 ref, append. OWRT C-3277(No. 7313)(11).

Descriptors: *Aquifer systems, *Glacial aquifers, *Groundwater recharge, *Mathematical models, Water resources, Planning, Groundwater, Aquifers, Recharge, Base flow, Hydraulic conductivity, Infiltration, Aquifer characteristics, Aquifer management, Aquitards, *Indiana, City planning, Regional analysis.
Identifiers: *Lafayette(Ind).

A deterministic digital model is developed representing glacial aquifers to assist water resource planners of medium size urban communities. The glacial aquifer selected as the test site was that underlying the Greater Lafayette, Indiana Area. The digital model was formulated by using the finite difference method. Initial estimates of recharge from ponds and base flow into streams were obtained from a flow net analysis. Cross correlations and time lags between rainfall, river stages and groundwater levels were examined to introduce net recharge due to rainfall into the model and to establish the hydraulic interaction between the rivers and the aquifer. The digital model was calibrated by using a parameter adjustment procedure. The values of hydraulic conductivity, storage coefficient, net recharge due to rainfall and base flow into the stream were suitably adjusted to simulate the observed historic water levels. Stochastic difference equation models were fitted into the historic input time series of rainfall and river stages and these models were used to provide inputs to estimate the aquifer capacity under increased water demand. Results showed that the cross correlation studies were useful in introducing recharge due to rainfall and in examining the hydraulic connection between the rivers and the aquifer. The vertical leakage from the overlying aquitards and the induced streambed infiltration were included in the digital model as lumped quantities without considering the physical properties of the overlying aquitards and the streambed. (See also W76-11175)
W76-11176

SYSTEMATIC DEVELOPMENT OF METHODOLOGIES IN PLANNING URBAN WATER RESOURCES FOR MEDIUM SIZE COMMUNITIES: POPULATION CHARACTERISTICS AND RESIDENTIAL WATER USE,
Purdue Univ., Lafayette, Ind. Dept. of Sociology and Anthropology.
H. R. Potter, E. R. Cooper, and L. Z. Breen.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-256 566, $4.00 in paper copy, $3.00 in microfiche. Purdue University Water Resources Research Center, Technical Report No. 63, May 1976. 35 p, 5 fig, 15 tab, 88 ref. OWRT C-3277(No. 7313) (13).

Descriptors: *Community development, *Growth rates, Human population, Social aspects, Urban sociology, City planning, Water utilization, *City planning, *Indiana, Regression analysis.
Identifiers: *Demographic studies, Urban Water Resources Development, Medium size communities, *Lafayette(Ind).

Household technology has increased the use of residential water. In this study involving the Lafayette-West Lafayette, Indiana Area, there were substantial differences in the quantity of water used by different residences and these differences were shown to be related to socio-economic and demographic characteristics. These relationships, in combination with population projections, can be used for predicting future water demand. The use of tracts and blocks were compared in the study. Tracts were the larger area units containing 4000 or more persons. Because of the larger number of blocks, there was an advantage in their use in examining relationships. In the analyses high income tracts had per capita water consumption rates about 3 times that of the low income. Positive relationships were found between water use and housing value, median number of rooms, percent of families in single dwellings, percent of high school graduates and percent of white collar workers. Percent in families below the poverty level was negatively related. Multiple regression analysis of the block data generally supported the interpretation of the tract data. Age of residents did not show a consistent pattern. Significant interactions were found for age with owned housing values and home size. (See also W76-11175) (Wierswa-Purdue)
W76-11177

SOME ISSUES REGARDING REGULATORY POLICY, POLITICAL PARTICIPATION, AND SOCIAL IMPLICATIONS OF GEOTHERMAL RESOURCE DEVELOPMENT IN THE IMPERIAL VALLEY,
Center for Social and Behavioral Science Research. University, Riverside, California.
For primary bibliographic entry see Field 6E.
W76-11328

EFFECTS OF WATER QUALITY ON THE RECREATIONAL USE OF WATER IN SOUTH EAST TEXAS,
Lamar Univ., Beaumont, Tex. Dept. of Industrial Engineering.
For primary bibliographic entry see Field 5G.
W76-11335

AN EVALUATION OF PUBLIC HEARINGS ON WATER DEVELOPMENT PROJECTS IN MISSISSIPPI,
Mississippi State Univ., Mississippi State. Social Science Research Center.
G. D. Hampe.
Available from the National Technical Information Service Springfield, Va 22161, as PB-256 583, $5.00 in paper copy, $3.00 in microfiche. Mississippi Water Resource Research Institute, Mississippi State, Completion Report, July 1976. 74 p, 34 tab, 12 ref, 2 append. OWRT A-091-MISS(1).

Descriptors: *Social participation, Mississippi, Evaluation, Projects, Water resources development, Public rights, Social aspects, Social values, Social change.
Identifiers: *Public participation.

Research findings from three modes of investig
tion relating to public participation in pub
meetings held by the Corps of Engineers duri
the period 1962-1975 showed similar results. Mo
participants supported the projects proposed
the Corps. Participants were on the average o
higher social class than the general populati
The main conclusion to be drawn from t
research was that the Corps has responded to
public in the past and continues to do so at prese
Younger participants in the public hearing proc
are beginning to bring into focus more opposit
than has existed in the past. The public to wh
the Corps has responded and continues to respo
consists of the leading members of the busin
and political communities.
W76-11337

**ESTABLISHING INSTREAM FLOWS: ANAL
SIS OF THE POLICY-MAKING PROCESS
THE PACIFIC NORTHWEST,**
Washington State Univ., Pullman. Dept. of Po
cal Science.
P. L. Beckett, and B. L. Lamb.
Available from the National Technical Infor
tion Service Springfield, Va 22161, as PB-256
$5.00 in paper copy, $3.00 in microfiche. Com
tion Report, (1976). 76 p, 18 tab. OWRT A-
WASH(3), 14-34-0001-6050.

Descriptors: Water utilization, Water all
tion(Policy), Flow, Low flow, *Decision-mak
Legal aspects, *Pacific Northwest U. S., *W
policy, *Competing uses.
Identifiers: *Instream flow, Minimum flow.

An analysis was conducted of the decision-ma
process in natural resources management, acc
plished through investigation of the establish
of instream flows in the Pacific Northwest
stream uses of water are those which use the w
while it remains in the stream. These uses re
water flow for fish and wildlife habitat, na
tion, hydro-electric power production, recrea
aesthetics and waste dilution. A wide variet
agencies of both the federal and state governm
is involved in determining policy regarding
amount of water to be left in streams. Practitio
in the field of natural resource management
some members of the general public are frust
because the decision-making process does
conform to notions about rationality and
prehensiveness in policy-making. Policy-maki
the American political culture has traditio
reflected the interplay of a variety of inte
often in conflictual situations. However, deci
making is more than conflict and bargaining a
agencies. Four hypotheses are suggested
discussed. First, it is suggested that at the s
level decision-making is characterized by ba
ing. Second, it is suggested that at the group
decisions are made by muddling through, or i
mental reliance on previous policy stands. Th
is suggested that at the group level policy is
in part through organizational process. Th
agencies rely on a repertoire of procedures t
lect and process information; they follow ro
Fourth, it is suggested that at the individual
agency representatives tend to align thems
with others in the same profession, thus miti
conflicts between agencies. Data collected f
survey questionnaire, content analysis, an
sonal interviews are used in this analysis.
W76-11339

**TEXAS COASTAL MANAGEMENT PROG
HEARING DRAFT. EXECUTIVE SUMMA
Texas General Land Office, Austin.
June 1976, 55 p.

Descriptors: *Texas, *Continental shelf, *C
*Land use, *Resources develop
*Management water resources, Economics,
dustry, Biota, Aquatic life.
Identifiers: *Outer Continental Shelf, C
zone management.

bjectives of the Texas Coastal Management am are, through interagency cooperation and sive public participation, to develop and mend to the governor and legislature: an im- d and flexible policymaking process which nsure a continuing balance among future mic, environmental and social needs along ast; and the steps for implementing such a s. This document summarizes the draft mendations developed to date by this pro- and it is intended to inform the public of recommendations prior to public hearings. lso W76-11466 and W76-11467) (Sinha -
1465

S COASTAL MANAGEMENT PROGRAM.
NG DRAFT.
General Land Office, Austin.
76. 114 p, 23 ref, 5 plates.

tors: *Texas, *Continental shelf, *Oil in- *Resources development, Water es, *Aquatic life, Estuaries, Bays, s, Vegetation, Management, Coasts, Maps. ers: *Outer Continental Shelf, Gas indus- astal Zone Management.

xas Coastal Management Program was in- n June of 1974 as a joint project by the natural resource agencies to devise a flexi- cy-planning process. After an extensive of existing resource data and current ental authority for coastal management, a ensive inventory of Texas coastal es, a study of current and projected ic activity, and an intensive public par- n program, the Coastal Management Pro- as developed recommendations for a to resolve future conflicts in resource use. ume presents: the bases for the state's regarding Texas coastal waters and ad- horelands; the various local, regional, nd federal authorities now managing resources; documentation of coastal judged to be both important and proper f state concern; the program's conclu- d recommendations for improving the anagement process; and a review of the es and disadvantages associated with pposed changes. (See also W76-11465) EIS)
66

OASTAL MANAGEMENT PROGRAM.
G DRAFT. APPENDICES.
neral Land Office, Austin.
. 161 p, 40 fig.

rs: *Texas, *Continental shelf, s, Water resources, Ecology, nent, *Land use, *Aquatic life, *Biota, Coasts, Shores, Marshes, Estuaries, Recreation, Energy.
: *Outer Continental Shelf, Coastal agement, Seagrass.

e contains 7 appendices to the final re- e Texas Coastal Management Program. nation presented was used in the formu- he recommendations of the Program. 1 is a generalized description of the resource areas of coastal waters and . Appendix 2 presents a method for the functioning of an ecological system e use of an ecological systems diagram. 3 details analytical routine which may r assessing the effects of activities in ters or shorlands. Appendix 4 is con- n the implementation of an activity-as- outine. Included is a detailed examina- way this procedure could be used in the and review processes. Appendix 5 he present authorities of state and ncies which are involved in coastal t. Appendix 6 defines the national in- terest in the coastal region of Texas. It contains a definition of lands excluded from the management area, recommended state-federal coordination mechanisms, and summaries of federal agency statements of national interest. Appendix 7 reviews the proposed coastal management process. It demonstrates how this process solves the problems of policy gaps and conflicts while offering a comprehensive coastal management plan. Included is a summary of present substantive resource policies and recommended additions. (See also W76-11465) (Sinha - OEIS)
W76-11467

REVIEW OF OFFSHORE EXPLORATION IN FLORIDA,
University of South Florida, Tampa. Dept. of Geography.
For primary bibliographic entry see Field 6G.
W76-11470

PROCEEDINGS TENTH BIENNIAL CONFERENCE ON GROUND WATER, TOTAL WATER MANAGEMENT FOR CALIFORNIA'S LONG-RANGE NEEDS.
California State Dept. of Water Resources, Scramento.
For primary bibliographic entry see Field 4B.
W76-11491

MANAGEMENT OF WATER RESOURCES UNDER DIFFERENT SOCIO-ECONOMIC CONDITIONS,
Arizona University, Tucson, Committee on Arid Lands Resources.
S. M. H. Bokhari.
Ph.D. Dissertation, 1975. 289 p, 24 tab, 130 ref.

Descriptors: *Arid lands, *Water resources development, *Water management(Applied), *Constraints, Cost-benefit analysis, Decision making, Social aspects, Economics, Management, Project planning, Project post-evaluation, Irrigation, *Arizona, *Crop production.
Identifiers: Wellton-Mohawk Irrigation District(Ariz), Salinity Control and Reclamation Project(Pakistan), *Pakistan.

A review is presented of current strategies, objectives, methodologies and practices in the field of water resources development and management, with particular attention to constraints under different socio-economic conditions. The applicability of a 'cost-effectiveness' approach to hindsight evaluation of water projects is discussed. That approach can be used for 'ex-ante' and 'ex-post' evaluation, comparative evaluation of more than one objective, and for tangible and intangible measures of effectiveness. Water management under different socio-economic conditions has been analyzed by comparing the performances of the Wellton-Mohawk Irrigation District in Arizona with the Salinity Control and Reclamation Project No. 1 in Pakistan. The American system is flexible enough to accomodate any technological innovation and can supply the full water requirement for any cropping pattern, while the Pakistan system has an inelastic 7-day fixed roster for water supply which is inadequate for even 50% of the presently irrigated area. Recommendations are made for removing management constraints in Pakistan and other developing countries. (Jahns-Arizona)
W76-11514

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

ENERGY REDUCTION THROUGH IMPROVED IRRIGATION PRACTICES,
Nebraska Univ., Lincoln. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 3F.
W76-11109

LAND PRICES IN FLOOD HAZARD AREAS: APPLYING METHODS OF LAND VALUE ANALYSIS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6F.
W76-11112

COST SHARING TO INDUCE EFFICIENT TECHNIQUES OF ABATING WASTEWATER POLLUTION,
National Bureau of Standards, Washington, D.C., Building Economics Section.
For primary bibliographic entry see Field 5G.
W76-11135

THE ECONOMICS OF FISHING AND MODERN CAPITAL THEORY: A SIMPLIFIED APPROACH,
British Columbia Univ., Vancouver. Dept. of Economics; and British Columbia Univ., Vancouver. Dept. of Mathematics.
C. W. Clark, and G. R. Munro.
Journal of Environmental Economics and Management, Vol. 2, No. 2, p 92-106, December 1975. 3 fig, 39 ref.

Descriptors: *Fishing, *Fisheries, *Economics, *Capital, Costs, Benefits, Investment, Linear programming, Dynamic programming, Management, Water resources, Control, Systems analysis, Mathematical models, Equations.
Identifiers: Benefit maximization, Nonautonomous models, Nonlinear programming, Capital theory.

While the link between fisheries economics and capital theory has long been recognized, fisheries economics has, until the last few years, developed largely along nondynamic lines. The purpose of this article is to demonstrate that, with the aid of optimal control theory, fisheries economics can without difficulty be cast in a capital-theoretic framework yielding results that are both general and readily comprehensible. Developed is a dynamic linear autonomous model. The static version of the fisheries economics model is seen to be the equivalent of a special case of the dynamic autonomous model. The model is then extended, first by making it nonautonomous and second, nonlinear. Problems arising therefrom, such as multiple equilibria, are considered. (Bell-Cornell)
W76-11140

ESTIMATED COSTS OF MECHANICAL CONTROL OF WATER HYACINTHS,
Georgia Univ., Athens. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 5G.
W76-11141

COST BENEFIT ANALYSIS AND WATER POLLUTION POLICY.
Urban Inst., Washington, D.C.
For primary bibliographic entry see Field 5G.
W76-11153

COSTS OF WATER QUALITY IMPROVEMENT, TRANSFER FUNCTIONS, AND PUBLIC POLICY,
Resources for the Future, Washington, D.C.
For primary bibliographic entry see Field 5G.
W76-11158

ENVIRONMENTAL POLICY COSTS: DEFINITION, MEASUREMENT, AND CONJECTURE.
California Univ., Riverside.
For primary bibliographic entry see Field 5G.
W76-11159

UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN

ESTIMATES OF INDUSTRIAL WATERBORNE RESIDUALS CONTROL COSTS: A REVIEW OF CONCEPTS, METHODOLOGY, AND EMPIRICAL RESULTS,
Johns Hopkins Univ., Baltimore, Md.
For primary bibliographic entry see Field 5G.
W76-11160

COST OPTIMIZATION OF RURAL WATER SYSTEMS,
Iowa State Univ., Ames. Dept. of Civil Engineering.
R. B. Robinson, and T. A. Austin.
Journal of the Hydraulics Division, Proceedings of the American Society of Civil Engineers, Vol. 102, No. HY8, Proceedings paper No. 12301, p 1119-1134, August 1976. 7 fig, 4 tab, 6 ref. OWRT A-048-IA(2)

Descriptors: *Water distribution(Applied), *Water supply, *Regional analysis, *Costs, Linear programming, Design, Hydraulics, Mathematical models, Optimization, Engineering, Systems analysis, Pipes.
Identifiers: *Cost minimization.

A rural water system is a water supply and distribution system that is built for low density predominately unincorporated rural areas. It primarily serves domestic and livestock needs and does not necessarily supply fire fighting requirements. The pipe distribution network has the unique feature of being an unlooped or dead-end system in most cases. This paper describes a method for achieving the least cost or 'optimal design' for certain portions of rural water distribution system. Optimization is achieved by methods that combine linear programming and engineering judgment. The variables that can be considered by this programming approach are: (1) pipe diameter; (2) pipe pressure rating; (3) pressure reducing valve setting and location; and (4) pumping head or water tower height. The method has been demonstrated on a simple hypothetical distribution system with good results. (Bell-Cornell)
W76-11167

THE REDISTRIBUTIONAL CONSEQUENCES OF PUBLIC RECREATION PROVISION AT THE POTHOLES RESERVOIR--COLUMBIA BASIN PROJECT, WASHINGTON,
Washington State Univ., Pullman. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6B.
W76-11168

MAINTENANCE MANAGEMENT OF WATERWORKS SYSTEM,
Thorne Riddell Associates Ltd., Toronto (Ontario).
For primary bibliographic entry see Field 5F.
W76-11254

GRANULAR MEDIA FILTRATION: A POSITIVE COST EFFECTIVE METHOD TO PREPARE WASTEWATERS FOR REUSE BY REMOVAL OF SUSPENDED SOLIDS,
Ecodyne Corp., Union, N. J. Industrial Waste Treatment Div.
For primary bibliographic entry see Field 5D.
W76-11262

WASTEWATER RECYCLE - THE PROPER APPROACH TO EVALUATION OF DISPOSAL VERSUS REUSE,
Ecodyne Corp., Union, N. J. Industrial Waste Treatment Div.
For primary bibliographic entry see Field 5D.
W76-11263

A QUADRATIC PROGRAMMING APPROACH TO THE PRODUCTION OF CALIFORNIA FIELD AND VEGETABLE CROPS EMPHASIZING LAND, WATER AND ENERGY USE,
California Univ., Davis. Dept. of Agriculture Economics.
For primary bibliographic entry see Field 3F.
W76-11326

THE IMPACT OF FLOODING UPON LAND VALUES IN THE BIG BLACK RIVER BASIN,
Mississippi Univ., University. Dept. of Economics.
W. E. Boyet, K. W. Hollman, and L. Sterling.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-256 578, $4.00 in paper copy, $3.00 in microfiche. Mississippi Water Resources Research Institute, Mississippi State, Completion Report, July 1976. 38 p, 3 fig, 7 tab, 21 ref. OWRT A-093-MISS(1).

Descriptors: Floods, *Flood damage, *Property values, Prices, *Pricing, Land appraisals, *Mississippi, Land use, Regression analysis, Model studies, Costs, Economics.
Identifiers: *Big Bear River basin(Miss).

The purpose was to determine the impact of flooding upon the value of land in the Big Black River basin. Economic rent theory was extended and modified to explain how flooding influences land values. Two theoretical components of the overall effect of flooding were identified. First, it tends to cause shifts in land use to end eavors which yield lower returns. Second, it tends to increase production costs. The combined effect is to reduce realized earnings, thereby reducing land values. In order to obtain empirical estimates of these effects, sales price and other characteristics were ascertained for two independent samples of transfers, one which was flood-prone and one which was flood-free. Regression analysis was used to develop a model to explain variation in transfer prices for each of the two samples. Different variables were important in explaining price variation and there were significant differences in the coefficients of some variables between the two regressions. Additional regression analysis conducted on the flood-prone sample suggested that flooding which causes crop damage results in a reduction in value of $28 per acre or approximately 13 percent.
W76-11330

WICHITA FALLS INTEGRATED MUNICIPAL INFORMATION SYSTEM, WATER UTILITY PROCESSING SYSTEM (WUPS), APPLICATION COMPLETION REPORT, VOLUME I.
For primary bibliographic entry see Field 3D.
W76-11596

WICHITA FALLS INTEGRATED MUNICIPAL INFORMATION SYSTEM, WATER UTILITY PROCESSING SYSTEM (WUPS), APPLICATION COMPLETION REPORT, VOLUME II.
For primary bibliographic entry see Field 3D.
W76-11597

MANAGEMENT AND FINANCING ALTERNATIVES FOR WASTE DISPOSAL IN COASTAL AREAS,
North Carolina Univ. at Chapel Hill. Inst. of Government.
For primary bibliographic entry see Field 5E.
W76-11616

ECONOMIC IMPLICATIONS OF COASTAL WASTE DISPOSAL ALTERNATIVES,
Georgia Univ., Athens. Inst. of Natural Resources.
For primary bibliographic entry see Field 5E.
W76-11623

6D. Water Demand

UNDERGROUND STORAGE OF STA WATER PROJECT SUPPLY, A PROGRESS PORT,
Los Angeles City Dept. of Water and Pow Aqueduct Div.
For primary bibliographic entry see Field 4B.
W76-11119

6E. Water Law and Institutions

BELGIUM (LEGISLATION ON DERGROUND WATERS).
Food and Agriculture Organization of the Un Nations, Rome (Italy).
In: Water Law in Selected European Countr 1975. Vol 1, Chap IX, p 13-14, 6 ref.

Descriptors: *Water law, *Foreign countr *Water rights, Groundwater, Drilling, Admini tive agencies, *Legislation, Water wells, Min Europe, Water pollution control, Quarries, L aspects.
Identifiers: *Belgium, Drilling permits.

Water law in Belgium dictates that ground w rights belong to the overlying landowner. Ex tion of water for industrial or municipal use be licensed. Construction of trenches, sink or site pumps is prohibited near water cou Abandonded wells, boreholes and drilling tu are under control of administrative author Disposal of wastes therein is prohibited. Cons tion of mines, pits and quarries reaching a dep 30 meters must be certified. All underground ing activities are required to submit a det description of the extraction site, equipment rate of pumping. All facilities of this nature be constructed so as to allow measureme water levels at all times. (Heiss-NWWA)
W76-11120

ENGLAND AND WALES, (LEGISLATION UNDERGROUND WATERS).
Food and Agricultural Organization of the U Nations, Rome (Italy).
In: Water Law in Selected European Coun 1975. Vol 1, Chap IX, p 41-52, 4 ref.

Descriptors: *Water law, *Foreign cou *Water rights, Groundwater, Administrative cies, Water wells, Drilling, Europe, *Legisl Mining, Water pollution control, Legal aspec Identifiers: *England, *Wales, Well place Drilling permits.

The water law in England and Wales dictat water extracted from the ground belongs person who removed it and holds it in his p sion. Extraction of ground water is subj licensing by the water authority concern wells exceeding 50 feet are required to gistered with the Natural Environment Re Council and must have documented we operational logs. Construction of a well w water authority area, which does not re license must conform to a specification guarantees non-interference with pre-e wells, and notice must also be given to th authority concerned. Similar notice must b upon extension of a well or boring for the p of mineral extraction. (Heiss-NWWA)
W76-11121

FRANCE, (LEGISLATION ON UNDERG WATERS).
Food and Agricultural Organization of the States, Rome (Italy).
In: Water Law in Selected European Co 1975. Vol 1, Chap IX, p 67-69, 14 ref.

ptors: *Water law, *Foreign countries, r rights, Administrative agencies, Ground- Water wells, Drilling, Legal aspects, lation, Water pollution control, Europe, Ir- n wells, Waste disposal wells.
iers: *France, Drilling permits, Well place- Commercial water wells.

ıter law of France states that ground water belong to the overlying land owner. Water ed by that land owner for domestic pur- requires no authorization. Tapping of un- ınd waters for commercial purposes s authorization. The authorization will dic- lumes of water extracted and conditions which extraction is done. Extraction of y a landowner for irrigation purposes is not ble to provisions which allow for modifica- the authorized water allocation or restric- free sprinkle irrigation. Any extraction of water for non-domestic use must be re- and is subject to the supervision of the nent administration. All abandoned well es are also subject to government supervi- sposal of any wastes in these abandoned es is prohibited. Drilling and ground water on in areas designated as special water ment zones is closely regulated by the zone Major aquifer systems have been depart- ed. Drilling depths and ground water ex- rates have been standardized in an at- prevent aquifer depletion. Any mining ac- proposed gas storage area is liable for to aquifers which supply any public s. (Heiss-NWWA)
22

, (LEGISLATION ON UNDERGROUND S).
d Agricultural Organization of the United Rome (Italy).
r Law in Selected European Countries, l 1, Chap IX, p 99-100, 4 ref.

ors: *Water law, *Foreign countries, Ad- ive agencies, *Legislation Groundwater, recharge, Water wells, Drilling, Legal Water pollution control, Salinity, Mining, wells.
s: *Israel, Drilling permits.

r law of Israel states that all well drilling requires a license issued by the Water ioner. Licenses are subject to cancella- ange no later than 60 days following the the required pumping test. A driller must d by the Minister of Agriculture to test a pump it experimentally. A license is in order to plug a well. A detailed l operating log of this activity is also y the Commissioner. To prevent deple- linization of a water resource, or to pro- stic water supplies the Water Minister drilling licenses, dictate well specifica- production rates or cancel a well license. charge licenses are required and granted specific purposes. The Minister of e has additional recharge regulations directed to improve water quality and upplies. Any recharge license applica- n to a hearing of opposing views. The ommissioner may not approve any roject which may in any way endanger ater supplies. The holder of a petroleum r the petroleum law is regarded as the water drilling license. Mining activities etitioned to the Water Commissioner uired to consult with the Controller of as to insure against interference with urces. (Heiss-NWWA)

EGISLATION ON UNDERGROUND

Agricultural Organization of the United ome (Italy).

In: Water Law in Selected European Countries, 1975. Vol 1, Chap IX, p 136-138, 24 ref.

Descriptors: *Water law, *Foreign countries, *Water rights, Administrative agencies, Riparian rights, Groundwater, Water wells, Drilling, *Legislation, Europe, Water pollution control, Legal aspects, Thermal water, Mineral water.
Identifiers: *Italy, Drilling permits, Water resource protection districts.

Exploitation of ground water is subject to different legal authorities depending on whether the activities take place within or outside of water resources protection districts. Within water resource protection districts ground water exploration is subject to administrative authorization with the local Office of Civil Engineering. Identified ground water bodies are registered as public water by the Ministry of Public Works. Rights to exploit registered public ground water are subject to administrative conformation. The right to exploit non-public ground water is free for the Riparian landowner provided he observes legal distances and conditions of exploitation. Outside water resource protection districts ground water exploration is free. The right to use non-public ground waters outside water resources protection districts is equally free subject to the same limitations as apply to riparian landowners within such districts. The provinces of Trento and Bolzano are delegated as sovereign legislative powers in respect to mineral and thermal waters. Conditions of mineral and thermal water exploration within authorized areas are identical to those governing ground-water exploration. (Heiss-NWWA)
W76-11124

SPAIN, (LEGISLATION ON UNDERGROUND WATERS).
Food and Agricultural Organization of the United Nations, Rome (Italy).
In: Water Law in Selected European Countries, 1975. Vol 1, Chap IX, p 188-192, 12 ref.

Descriptors: *Water law, *Foreign countries, *Water rights, Administrative agencies, Groundwater, Water wells, Drilling, *Legislation, Legal aspects, Water pollution control, Europe, Thermal water, Mineral water.
Identifiers: *Spain, Drilling permits, Andalusia, The Baleares, Almeria, Mineral waters, Thermal waters.

Ground water may be designated as either public or private. Public underground waters are those extracted or flowing on public domain lands and those occurring under the bed and within one hundred meters on either side of public streams. Private underground waters are those being extracted or flowing on private land. Ground water exploration on public land requires an administrative license. Exploitation necessitates an administrative concession. Ground water extraction works may be implemented only outside a 40 meter distance from neighboring buildings, railways or roads and outside a 100 meter radius of another well, spring, water course or public animal watering place. The extraction of private underground waters is subject to an administrative authorization rather than to a concession. In contrast, water legislation applicable to the Canary Islands dictates that all extractions and diversions, whatever the type of water, always require the authorization of the Hydraulic Services of the Canary Islands and Santa Cruz de Tenerife. Following the same approach the private underground water legislation for Andalusia, the Baleares and Almeria prohibits all extraction and diversion works except for ordinary wells until regulatory laws have been established. Mineral waters are classified as (a) Mineral-Medicinal Waters, which, because of their characteristics and quality are declared of public interest; (b) Mineral-Industrial Waters which allow for the rational use of substances they contain; (c) Thermal Waters, the temperature of which exceeds by 40 degrees centigrade the mean temperature of the place of emergence. Mineral waters are controlled by the Ministry of Industry, the General Directorate of Health and the Ministries of Public Works and of Agriculture. (Heiss-NWWA)
W76-11125

TURKEY, (LEGISLATION ON UNDERGROUND WATERS).
Food and Agricultural Organization of the United States, Rome (Italy).
In: Water Law in Selected European Countries, 1975. Vol 1, Chap IX, p 236-237, 11 ref.

Descriptors: *Water law, *Foreign countries, *Water wells, Administrative agencies, Groundwater, Drilling, *Legislation, Legal aspects, Water pollution control.
Identifiers: *Turkey, *Drilling permits.

The water laws of Turkey dictate that all ground water exploration operations are to be undertaken in accordance with the specifications issued by the Ministry of Power and Natural Resources. The drilling of all wells requires a permit issued by the General Directorate of Hydraulic Works (GDHW). Once ground water has been found, its use is authorized immediately but is limited by the beneficial use criterion. In addition an application for the obtention of an exploitation permit is to be filed with the GDHW. The permit will state the authorized amount of water to be extracted and used. Public exploration or control wells may be sunk on private land without the requirements of expropriation and compensation, the transformation thereof into exploitation wells is subject to the expropriation of private land for the well itself and for related water conveyance installations. Control of aquifer depletion is administered by the Ministry of Power and Natural Resources. Although the drilling of wells for purposes other than Water Resource exploitation does not require a water use permit, the GDHW does request information from such well operators so as to preclude interference and contamination of adjacent ground water supplies. (Heiss-NWWA)
W76-11126

VILLAGE WATER SUPPLY, A WORLD BANK PAPER.
International Bank for Reconstruction and Development, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-11143

COST-BENEFIT ANALYSIS, PROPERTY RIGHT SPECIFICATION AND 'DISTRIBUTION',
Rand Corp., Santa Monica, Calif.
For primary bibliographic entry see Field 6B.
W76-11162

SOME ISSUES REGARDING REGULATORY POLICY, POLITICAL PARTICIPATION, AND SOCIAL IMPLICATIONS OF GEOTHERMAL RESOURCE DEVELOPMENT IN THE IMPERIAL VALLEY,
Center for Social and Behavioral Science Research. University, Riverside, California.
P. S. Green, and M. F. Steinberger.
Available from the National Technecial Information Service, Springfield, Va 22161, as PB-256 569, $4.50 in paper copy, $3.00 in microfiche. Working Papers in Public Policy, February, 1976, 54 p. (California Water Resources Center Project UCAL-WRC-W-344)

Descriptors: *Geothermal studies, *Attitudes, *Social aspects, *Economic impact, Decision making, *California, *Regulation, Water policy, Social participation, Political aspects, State governments, Local governments, Land use, Legislation.
Identifiers: *Imperial Valley(Calif).

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In order to delineate social and political issues relating to geothermal development, certain local government officials and community leaders in the Imperial Valley were interviewed on their perceptions of the potential of geothermal resources and regulatory problems implicit in development. County officials exhibited a strong belief that they had an 'overall responsibility' for the general welfare of the residents of Imperial County who would be affected by the potential economic, social, and environmental impacts of geothermal development. With little coordination among agencies at higher levels of government, County officials looked upon County regulations and coordination as a positive force that could: (1) minimize the negative impacts of geothermal development (2) encourage multipurpose utilization of geothermal resources, and (3) improve land use planning within their jurisdiction. Recommendations for improving the regulatory process include organizational and procedural changes and amendments to state energy legislation. Suggestions for improving public input into the governmental decision making process were presented in order to make geothermal regulations a joint effort of commercial developers, public officials, and private citizens. (Snyder - California, Davis)
W76-11328

DEVELOPMENT OF REGIONAL WATER MANAGEMENT SYSTEMS OPERATIONAL PROCEDURES,
University of Southern Mississippi, Hattierburg, Bureau of Business Research.
D. J. Etzold, and D. C. Williams, Jr.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-256 571, $4.00 in paper copy, $3.00 microfiche. Mississippi Water Resources Research Institute, Mississippi State, Completion Report, July 1976. 37 p, 1 tab, 9 ref, append. OWRT A-094-MISS (1).

Descriptors: Regional development, Management, *Water supply development, *Mississippi, *Regional analysis, *Institutional constraints, State governments, Local government.

The purpose was to identify multigovernmental constraints inherent in regional water supply development and to generate an organizational and procedural framework. There is some discussion of current water supply problems in southeast Mississippi, in general, and Jackson County, in particular. Governmental agencies with water development and management jurisdiction in Jackson County are identified. Thirteen officials and professionals were interviewed for the purpose of deriving their views on development of a regional water supply system. The results of the interviews are summarized. An organizational and procedural framework is discussed.
W76-11329

EVALUATION OF PRIOR APPROPRIATION IN MISSISSIPPI,
Mississippi State Univ., Mississippi State. Water Resource Research Inst.
L. O. Putt.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-256 581, $4.50 in paper copy $3.00 in microfiche. Completion Report, July 1976, 51 p. OWRT A-092-MISS(1).

Descriptors: Water law, *Prior appropriation, *Mississippi, Legal aspects, *Water rights, *Riparian rights, Permits, *Regulation, State governments, *Diversion, Administration.

Surface water rights and the administration of Mississippi's water appropriation system are discussed. Mississippi has adopted a prior appropriation system to regulate the use of surface waters. A permit system was initiated to protect vested riparian rights and to prohibit the total depletion of stream flow. However, riparians may not exercise their rights without either a judicial determination of their rights or a permit to exercise them. A water right under the Mississippi prior appropriation system, whether it belongs to a riparian claimant or a permittee, is defined as a certain maximum quantity of water, to be diverted at a certain maximum rate of diversion, during a stated time, at a specific point of diversion, applied to a specific parcel of land for a specified purpose. There is a priority system established for permittees in terms of time but none for use and almost any use could be beneficial use as long as the Board of Water Commissioners approves it. Ground water and diffused surface water sources are specifically excluded from the law. Domestic uses are excluded as are operations for the dredging or washing of sand and gravel. The prior appropriation system in Mississippi even with its comprehensiveness and flexibility, is subject to various criticisms.
W76-11336

ESTABLISHING INSTREAM FLOWS: ANALYSIS OF THE POLICY-MAKING PROCESS IN THE PACIFIC NORTHWEST,
Washington State Univ., Pullman. Dept. of Political Science.
For primary bibliographic entry see Field 6B.
W76-11339

STATUS OF THE NPDES (NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM) IN THE SOUTHEAST,
Environmental Protection Agency, Atlanta, Ga. Region IV.
For primary bibliographic entry see Field 5G.
W76-11371

LEGAL INSTITUTIONS FOR THE ALLOCATION OF WATER AND THEIR IMPACT ON COAL CONVERSION OPERATIONS IN KENTUCKY,
Kentucky Univ., Lexington.
R. C. Ausness, G. W. Callahan, S. W. Dills, B. H. Flynn, and J. S. Gillig.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-256 796 $7.50 in paper copy, $3.00 in microfiche. Kentucky Water Resources Research Institute, Lexington, Research Report No. 95, August 1976. 186 p, 3 fig., append. OWRT A-060-KY(2), 14-31-0001-5017, 14-34-0001-6018.

Descriptors: Legal aspects, Legislation, Water law, *Water policy, Water resources development, *Kentucky, Water rights, Riparian rights, Prior appropriation, *Water allocation(Policy), *Consumptive use, *Regulation, *Water permits, Legislation.
Identifiers: *Coal conversion operations, *Administrative permit system.

The conversion of coal into other types of fuel through gasification and liquefaction has been proposed as a means of coping with America's increasing energy needs. Coal conversion plants require large quantities of water for cooling purposes and for use as a raw material. Three types of water allocation are presently used in the United States, riparianism, prior appropriation, and administrative permit systems. The common law riparian system is undesirable because under it water rights are insecure and subject to locational use restrictions. Prior appropriation is better, but the permanent water right created under this system results in excessive rigidity. A system of administrative regulation by means of a consumptive use permit system offers the best allocation framework for both coal conversion facilities and other water users as well. Kentucky presently has such a system of administrative allocation. However this legislation could be improved by (1) clarifying the planning functions of the Department for Natural Resources and Environmental Protection and the Water Resources Authority (2) expanding the scope of the consumptive use permit system by removing most of the exempted use categories; (3) adopting beneficial use as the basis upon which consumptive use permits will be granted. (4) imposing a durational limit on water use permits and delineating renewal procedures. (5) adopting a scheme for transfers of water rights. (Huffsey-Kentucky)
W76-11489

MANAGEMENT OF WATER RESOURCES UNDER DIFFERENT SOCIO-ECONOMIC CONDITIONS,
Arizona University, Tucson. Committee on Arid Lands Resources
For primary bibliographic entry see Field 6B.
W76-11514

ENVIRONMENTAL ASSESSMENT OF MARINE OUTFALLS,
Environmental Protection Agency, Atlanta, Ga. Region IV.
For primary bibliographic entry see Field 5E.
W76-11615

MAN DISCOVERS THE COASTAL ENVIRONMENT: A FOOTPRINT IN THE SAND,
North Carolina State Univ. at Raleigh. University Studies.
For primary bibliographic entry see Field 5D.
W76-11621

6F. Nonstructural Alternatives

LAND PRICES IN FLOOD HAZARD AREAS: APPLYING METHODS OF LAND VALUE ANALYSIS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Agricultural Economics.
D. Damianos, and L. A. Shabman.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-256 233 $4.00 in paper copy, $3.00 in microfiche. Virginia Water Resources Research Center, Blacksburg, Bulletin 95, April, 1976. 48 p, 2 tab, 3 fig, 50 ref, append. OWRT A-054-VA(3).

Descriptors: *Flood control, Management, Economics, Land use, *Prices, Risks, *Flood plain insurance, Non-structural alternatives, *Flood damage, *Flood plain zoning, Market value, Statistical methods.
Identifiers: Flood insurance programs, *Flood hazard, *Residential land prices.

A case study approach was used to examine the influence on residential land prices of two factors (1) the presence of flood risk, and (2) the employment of structural or non-structural measures designed to minimize flood losses. The purpose was to see whether the influence of such factors on land price could be isolated. Information of this kind would be useful in developing flood management policies that could lead to public support of the most efficient mix of alternative for reducing flood damages. The market value of land, as used in this study, is defined within the context of a economic theory of land rent. The principal effort of the investigation was a statistical analysis of land sale prices directed toward isolating the influence of flood hazard. Two separate techniques of land value analysis were used. Results were generally consistent with the hypothesis that land sale prices directed toward isolating the influence of flood hazard. Two separate techniques of land value analysis are used. Results were generally consistent with the hypothesis that land sale price is negatively related to the potential of flood damage, and that erection of structural flood control measures enhances land prices. However, it was impossible to isolate the influence of flood plain zoning measures on land prices. For this a

r reasons the results are not considered con-
ve enough to support definitive policy conclu-
s. As a guide to further research in this area,
echniques used in this study are critiqued and
in conclusions are drawn.
-11112

ATRIX APPROACH FOR DETERMINING
TEWATER MANAGEMENT IMPACTS,
on (Roy F.), New York.
rimary bibliographic entry see Field 5G.
11128

T SHARING TO INDUCE EFFICIENT
HNIQUES OF ABATING WASTEWATER
LUTION,
nal Bureau of Standards, Washington, D.C.,
ing Economics Section.
rimary bibliographic entry see Field 5G.
11135

OD PLAIN INFORMATION: KASKASKIA
R, BEAR CREEK, LAKE FORK CREEK,
T FORK CREEK AND 'A' CREEK,
GLAS COUNTY, ILLINOIS, NO. 1.
Engineer District, St. Louis, Mo.
imary bibliographic entry see Field 4A.
1341

D PLAIN INFORMATION: LAKE MON-
NEAR SANFORD, FLORIDA.
Engineer District, Jacksonville, Fla.
imary bibliographic entry see Field 4A.
1342

D PLAIN INFORMATION: NORTHEAST
SIA COUNTY, FLORIDA.
Engineer District, Jacksonville, Fla.
mary bibliographic entry see Field 4A.
1343

D PLAIN INFORMATION: SWIFT
K, MACON AND BIBB COUNTY, GEOR-

Engineer District, Savannah, Ga.
mary bibliographic entry see Field 4A.
344

D PLAIN INFORMATION: WAYCROSS
AGE CANAL, WAYCROSS AND WARE
TY, GEORGIA.
ngineer District, Savannah, Ga.
nary bibliographic entry see Field 4A.
345

PLAIN INFORMATION: BUCK CREEK
RASSY CREEK, MARION COUNTY, IN-

ngineer District, Louiville, Ky.
ıary bibliographic entry see Field 4A.
346

PLAIN INFORMATION: KENAI
PHASE II, KENAI PENINSULA
GH, ALASKA,
ngineer District, Anchorage, Alaska.
ary bibliographic entry see Field 4A.
47

PLAIN INFORMATION: FISHER
SANTA CLARA COUNTY, CALIFOR-

gineer District, San Francisco, Calif.
ary bibliographic entry see Field 4A.
48

FLOOD PLAIN INFORMATION: ALAMITOS CREEK, INCLUDING GUADALUPE CREEK-ARROYO CALERO AND SANTA TERESA CREEK, SANTA CLARA COUNTY, CALIFORNIA,
Army Engineer District, San Francisco, Calif.
For primary bibliographic entry see Field 4A.
W76-11349

FLOOD PLAIN INFORMATION: DEER CREEK AND WHITE RIVER, EARLIMART, CALIFORNIA,
Army Engineer District, Sacramento, Calif.
For primary bibliographic entry see Field 4A.
W76-11350

FLOOD PLAIN INFORMATION: GREEN VALLEY, DAN WILSON, AND SUISUN CREEKS, CORDELIA, CALIFORNIA.
Army Engineer District, Sacramento, Calif.
For primary bibliographic entry see Field 4A.
W76-11351

FLOOD PLAIN INFORMATION: CACHE LA POUDRE RIVER, COLORADO, VOL. III. FORT COLLINS-GREELEY-LARIMER-WELD COUNTY.
Army Engineer District, Omaha, Nebr.
For primary bibliographic entry see Field 4A.
W76-11352

FLOOD PLAIN INFORMATION: WABASH RIVER, MIAMI COUNTY AND PERU, INDIANA.
Army Engineer District, Louisville, Ky.
For primary bibliographic entry see Field 4A.
W76-11353

FLOOD PLAIN INFORMATION: POGUES RUN, PLEASANT RUN, AND BEAN CREEK, MARION COUNTY, INDIANA.
Army Engineer District, Louisville, Ky.
For primary bibliographic entry see Field 4A.
W76-11354

FLOOD PLAIN INFORMATION: LICK CREEK AND LITTLE BUCK CREEK, MARION COUNTY, INDIANA.
Army Engineer District, Louisville, Ky.
For primary bibliographic entry see Field 4A.
W76-11355

FLOOD PLAIN INFORMATION: LITTLE ARKANSAS RIVER AND SAND CREEK, SEDGWICK, KANSAS.
Army Engineer District, Tulsa, Okla.
For primary bibliographic entry see Field 4A.
W76-11356

FLOOD PLAIN INFORMATION: BIG SANDY RIVER, BOYD COUNTY, KENTUCKY.
Army Engineer District, Huntington, W. Va.
For primary bibliographic entry see Field 4A.
W76-11357

FLOOD PLAIN INFORMATION: QUINEBAUG RIVER - CADY BROOK, TOWN OF SOUTHBRIDGE, MASSACHUSETTS.
Army Engineer District, Waltham, Mass.
For primary bibliographic entry see Field 4A.
W76-11358

FLOOD PLAIN INFORMATION: MERRIMACK RIVER, CITY OF CONCORD, NEW HAMPSHIRE.
Army Engineer District, Waltham, Mass.
For primary bibliographic entry see Field 4A.
W76-11359

FLOOD PLAIN INFORMATION: ALUM CREEK, VICINITY OF COLUMBUS, OHIO.
Army Engineer District, Huntington, W. Va.
For primary bibliographic entry see Field 4A.
W76-11360

FLOOD PLAIN INFORMATION: SOUTH FORK RIVANNA RIVER, ALBEMARLE COUNTY, VIRGINIA.
Army Engineer District, Norfolk, Va.
For primary bibliographic entry see Field 4A.
W76-11361

6G. Ecologic Impact Of Water Development

POLITICAL RESOLUTION OF ENVIRONMENTAL CONFLICTS,
Waterloo Univ. (Ontario). Dept. of Systems Design.
K. W. Hipel, R. K. Ragade, and T. E. Unny.
Water Resources Bulletin, Vol. 12, No. 4, p 813-827, August 1976. 2 fig, 9 tab, 17 equ, 4 ref.

Descriptors: *Water resources, *Management, *Water pollution, *Political aspects, *Decision making, *Linear programming, Economic feasibility, Treatment facilities, Optimization, Wastes, Sewers, Environmental control, Equations, Mathematical models, Systems analysis.
Identifiers: *Metagame analysis, Bargaining process, Profit maximization.

Many water resources management problems ultimately require a political decision in order to formulate a course of action to follow. Metagame analysis is a nonquantitative technique that can model the decision-making process and is used herein to arrive at a politically feasible solution to a typical water pollution problem. The output from the linear programming formulation of the problem is used as input to the 'political' metagame analysis. This allows a solution to the pollution conflict that is not only physically and economically feasible according to the linear programming analysis, but politically feasible as well. (Bell-Cornell)
W76-11129

IMPACT STATEMENT FOR THE AQUATIC PLANT-CONTROL PROGRAM-STATE OF TEXAS,
Army Engineer District, Galveston, Tex.
C. Novosad, W. T. Nailon, and E. O. Gangstad.
In: Aquatic Plant Control Program: Integrated Control of Alligator Weed and Water Hyacinth in Texas, Army Engineer Waterways Experiment Station, Vicksburg, Miss., Technical Report No. 9, March 1975, p. B3-B8. 6 ref.

Descriptors: *Aquatic weed control, *Herbicides, *Environmental effects, *Water hyacinth, *Alligatorweed, *Texas, Biocontrol, 2,4-D, Chemcontrol, Water pollution control, Toxicity, Safety, Spraying, Pesticide residues, Potable water, Biodegradation, Hazards.
Identifiers: Silvex, Environmental Impact Statement, Agasicles hygrophila.

The environmental impact of the Texas water hyacinth and alligator weed control program is evaluated. The program is restricted to the use of Agasicles hygrophila, the flea beetle for alligator weed control and one of the amine salts and the butoxyethanol ester of 2,4-D; some critical areas will be controlled with the PGBEE of silvex. The beneficial effects are that weed elimination will improve water quality, reduce impediments to navigation, flood control, irrigation, and recreation, and aid fish and wildlife management and disease-vector control. There are no known detrimental effects of 2,4-D usage. The adverse effect may be that dying vegetation may temporarily deplete the dissolved oxygen and deleterious to fish. The

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amine salt and butoxyethanol ester of 2,4-D are extremely toxic to many broadleaf plants but suitable application methods, observance of season, and atmospheric conditions will minimize drift. Precautions will be taken to keep 2,4-D concentrations in water below 0.5 ppm near estuaries. Treatment may be needed to remove tastes and odors inducted by the herbicides in potable water; but 2,4-D does not degrade to form 2,4-dichlorophenol and does not impair drinking water when used according to prescribed limitations. (See also W76-11145) (Auen-Wisconsin)
W76-11146

ENVIRONMENTAL POLICY COSTS: DEFINITION, MEASUREMENT, AND CONJECTURE,
California Univ., Riverside.
For primary bibliographic entry see Field 5G.
W76-11159

VALUING LONG-RUN ECOLOGICAL CONSEQUENCES AND IRREVERSIBILITIES,
Maryland Univ., College Park. Dept. of Economics.
A. C. Fisher, and J. V. Krutilla.
In: Cost Benefit Analysis and Water Pollution Policy, Environmental Protection Agency and Urban Institute Symposium, September 5-7, 1973, Annapolis, Md. Published in 1975, p. 271-290. 25 ref.

Descriptors: *Cost-benefit analysis, *Pollution abatement, *Evaluation, *Environmental effects, *Conservation, Theoretical analysis, Investment, Welfare(Economics), Discount rates, Projections, Decision making, Protection.
Identifiers: *Evaluation of irreversible pollution, Option value.

A theoretical approach, illustrated by examples, considers the nature and the implications, for economic theory and policy, of investments in water (and other) resources that may involve adverse effects on the physical environment that are either difficult or impossible to reverse. The problem has a duality in that investments in abatement of environmental disruption are made within some known period of time, 'not investing' is then irreversible, in the sense that if the investment in abatement is not made within this period, it will not be possible to make it and to capture the benefits later. The discussion attempts to indicate the nature of the long-run or irreversible ecological consequences--how they differ from the consequences of ordinary economic decisions, and to derive some modeled implications for policy with respect to investments which can either give rise to these irreversible effects or, alternatively, avert them. Related issues such as the choice of welfare criteria, the choice of discount rate, the role of uncertainty, and option value are also considered. (See also W76-11153) (Auen-Wisconsin)
W76-11161

PROCEEDINGS OF THE SYMPOSIUM ON OFFSHORE OIL POTENTIAL AND RELATED LAND USE IMPACTS IN THE CENTRAL CALIFORNIA COASTAL ZONE.
California Univ., Santa Cruz, Coastal Marine Lab.
Proceedings of the Symposium on Offshore Oil Potential and Related Land Use Impacts in the Central California Coastal Zone, held Santa Cruz, Calif. on June 8, 1975. Also as Calif. Univ. Coastal Marine Studies Special Publication No. 3. Doyle, W. T. (ed.)

Descriptors: *Continental shelf, Resources development, *Oil industry, Water resources, *Environmental effects, Drilling, Offshore platforms, *California, *Land use, Legal aspects.
Identifiers: *Outer Continental Shelf, Offshore technology.

The proceedings includes presentations and question and answer remarks from a symposium held on June 8, 1975, at the University of California/Santa Cruz. Following opening remarks papers were presented on: Tectonic and Basin Development of the Central California Coastal Area by Eli Silver; Estimating Potential Oil Resources in the Central California Coastal Zone by James Taylor, Offshore Petroleum Extraction and Onshore Facilities by Darrell Warner; Potential Land Use Conflicts Resulting from Offshore Drilling in the Central California Coastal Area by James Pepper; Legal Issues of Regulating the Coast by Gerald Bowden; and Panel Question and Answer Session by all authors. (Sinha - OEIS)
W76-11461

RANDOM MODEL OF EVAPORATION OF OIL AT SEA,
Mathematica, Inc., Philadelphia, Pa.
For primary bibliographic entry see Field 5B.
W76-11462

THE ALERT BAY OIL SPILL: A ONE-YEAR STUDY OF THE RECOVERY OF A CONTAMINATED BAY,
Environment Canada, Victoria, B. C. (Canada). Marine Sciences Directorate, Pacific Region.
For primary bibliographic entry see Field 5C.
W76-11463

MODELING THE FATES OF METALS IN OCEAN-DISCHARGED WASTEWATERS,
Southern California Coastal Water Research Project, El Segundo.
For primary bibliographic entry see Field 5B.
W76-11464

TEXAS COASTAL MANAGEMENT PROGRAM. HEARING DRAFT. EXECUTIVE SUMMARY.
Texas General Land Office, Austin.
For primary bibliographic entry see Field 6B.
W76-11465

TEXAS COASTAL MANAGEMENT PROGRAM. HEARING DRAFT.
Texas General Land Office, Austin.
For primary bibliographic entry see Field 6B.
W76-11466

TEXAS COASTAL MANAGEMENT PROGRAM. HEARING DRAFT. APPENDICES.
Texas General Land Office, Austin.
For primary bibliographic entry see Field 6B.
W76-11467

FLORIDA COASTAL POLICY STUDY: THE IMPACT OF OFFSHORE OIL DEVELOPMENT,
Florida State Univ., Tallahassee. Dept. of Urban and Regional Planning.
A. L. Pearman, and J. W. Stafford.
Florida State University and University of South Florida, Final Report, December 1975. (Reprinted: June, 1976). 273 p, 114 ref.

Descriptors: *Continental shelf, *Oil spills, *Oil pollution, *Resources development, *Environmental effects, *Offshore platforms, *Florida, Water resources, Pipelines, Drilling, Aquatic environment, Aquatic habitats, Aquatic life, Estuaries, Bays, Coasts, Exploration, Exploitation, Fish, Reptiles, Mammals, Remote sensing, Grasses.
Identifiers: *Outer Continental Shelf, *Deepwater ports, Environmental impacts, Coastal management.

Offshore oil and gas developments are examined from a number of perspectives: economic, environmental, legal, and social. The study is designed to identify a set of policy alternatives which can be implemented to guide and regulate onshore developments so as to minimize the adverse impacts upon the areas most directly effected. The analysis of onshore impacts is base in part, upon a review of similar developments other coastal areas. The development of an info mation base which can be applied to potent developments in Florida is viewed as an essent element of this study. The main report consists ten chapters which present the major findings a recommendations of the study. The ten chapte are: Introduction, Review of Offshore Explorati in Florida, Facilities Associated with Offshore and Gas Development, Socio-Economic Impac of Offshore Oil and Gas Development: Scenario, The Impact on Local Governme Revenues and Expenditures, Environmental I pacts of OCS Oil and Gas Activity, Environmen Impacts and Monitoring of Oil and Gas Pipeline A Technical Note; Deepwater Ports: Policy Iss in Florida, Offshore Reserves and Fuel Availab ty; and Conclusions and Recommendations. T general conclusion derived from a review of potential environmental impacts of OCS oil relat activity is that planning can minimize the negat environmental impacts by: prohibiting the most o fensive or troublesome activities; controlling t location of activities permitted and controlling t volume and frequency of operations potential p ing critical threats of environmental degradati (See also W76-11469 thru W76-11474) (Sinha OEIS)
W76-11468

INTRODUCTION,
Florida State Univ., Tallahassee. Dept. of Urb and Regional Planning.
A. L. Pearman.
In: Florida Coastal Policy Study: The Impact Offshore Oil Development, December 1975. p. 30, 1 fig, 5 tab, 4 maps.

Descriptors: *Continental shelf, *Environmen effects, *Resources development, Wat resources, *Oil industry, *Florida, *Regulatio Coasts, Baseline studies, Economics, Explor tion, Facilities.
Identifiers: *Outer Continental Shelf, *Coast Zone Management.

The impacts which may be imposed on Flori communities would be generated by the activi necessary to discover and develop offsh reserves. The development of OCS oil and g resources can be divided into the following distin activities: Geophysical exploration, explorato drilling utilizing specialized mobile drilling rigs; stallation and operation of specialized fix production platforms; and transportation offshore production of oil by tanker, barge pipeline. Each phase of offshore activity requir the establishment and maintenance of onsho support facilities. The specific facilities requir will vary with the phase of OCS activity. T processes which are utilized to discover a develop OCS reserves place Florida primarily in reactive position. The timing of OCS lease sales a decision ultimately made at the federal lev Development of offshore reserves is the result private decisions which may be constrained b federal and state regulation. The role played b state and local governments in reacting to potenti impacts of offshore development must current be based upon the regulation of onshore (a nearshore) activities. (See also W76-11468) (Sin - OEIS)
W76-11469

REVIEW OF OFFSHORE EXPLORATION FLORIDA,
University of South Florida, Tampa. Dept. Geography.
J. W. Stafford.
In: Florida Coastal Policy Study: The Impact Offshore Oil Development, December 1975. p 53, 3 fig, 6 tab, 1 map.

Descriptors: *Florida, *Continental shelf, *Oil dustry, *Environmental effects, *Resour

evelopment, Water resources, *Economic im-
act, Economics, Exploration, Exploitation,
eases, Facilities.
entifiers: *Outer Continental Shelf, Territorial
aters, Gas industry, Policies, Petroleum, Coastal
one Management.

he nature and characteristics of offshore and
shore facilities associated with exploratory ac-
ity is specifically examined. The impacts of ex-
oratory activity on Florida communities are also
scussed. The United States Government's
cond lease sale of acreage in the eastern Gulf of
exico off Mississippi, Alabama and Florida, the
-called MAFLA area in 1973 is of special in-
est to Florida because of the 87 tracts, 62 are
ated adjacent to state waters. The relatively
all, but positive, economic impact of OCS ex-
oration on Florida coastal communities is in con-
st to the reduction in possible state revenues
sulting from the failure of recent exploratory ef-
ts initiated by the MAFLA sale. The changing
luation of Florida offshore tracts suggest that
timing of state lease sales may be critical.
owever the risks and uncertainties which charac-
ize policies permitting and encouraging rapid
oloitation of state offshore lands are likely to be
acceptable for a state which places a high value
maintaining a high level of environmental quali-
A more cautious leasing policy would be based
on an evaluation of any OCS discoveries prior
any extensive exploration of state lands. This
oroach would permit the incorporation of ex-
itation of state lands into an existing infrastruc-
e designed to accomodate offshore activity.
e current low valuation of Florida offshore
ds suggests that a more cautious state leasing
icy involves, at the worst, relatively small
ential sacrafice in terms of foreign revenues.
e also W76-11468) (Sinha - OEIS)
6-11470

**VIRONMENTAL IMPACTS OF OCS OIL
D GAS ACTIVITY,**
versity of South Florida, Tampa. Dept. of
ography.
. Stafford.
Florida Coastal Policy Study: The Impact of
shore Oil Development, December 1975. p 131-
4 tab.

criptors: *Continental Shelf, *Florida,
vironmental effects, *Resources develop-
t, Oil spills, *Oil pollution, Oil fields, Oil in-
ry, Exploration, Transportation, Aquatic life,
lands, Beaches, Archaeology, Commercial
eries, Navigation, Facilities, Tourism.
tifiers: *Outer Continental Shelf,
vironmental impact, Gas fields, Refineries,
stal Zone Management.

elopment of outer continental shelf oil and gas
s involves geophysical exploration, explorato-
rilling, production, transportation, storage,
processing. Each of these activities has en-
mental impacts associated with it. The im-
s on the physical environment are usually
gible during geophysical exploration. How-
, the impacts associated with the various other
es of oil and gas activities can be very signifi-
The Department of Interior lists eight im-
producing factors and ten impact-sustaining
rs resulting from OCS operations. In anticipa-
of possible discoveries of major oil and gas
sits in the eastern Gulf of Mexico off the
da Coast each of these impact-producing and
ct-sustaining factors should be considered.
in aspects of oil and gas operations can cause
rse environmental effects which may be con-
ed unavoidable with current operation prac-
technology and regulations. Included in this
ory are the environmental effects on air and
quality, marine organisms, wetlands,
es, and aesthetic values; damage to histori-
nd archaeological sites, structures, and ob-
interference with commercial fishing opera-
and ship navigation, and conflict with other
f land. (See also W76-11468) (Sinha - OEIS)
W76-11471

ENVIRONMENTAL IMPACTS AND MONITORING OF OIL AND GAS PIPELINES: A TECHNICAL NOTE,
University of South Florida, Tampa. Dept. of Geography.
L. Limoges.
In: Florida Coastal Policy Study: The Impact of Offshore Oil Development, December 1975. p 163-191, 3 tab.

Descriptors: *Florida, *Continental Shelf, *Resources development, *Environmental effects, *Oil industry, Pipelines, Estuaries, Marshes, Aquatic life, Remote sensing, Monitoring.
Identifiers: *Outer Continental Shelf, Gas industry, Coastal zone management, *Environmental impact, Pipeline corridors.

The possible effects of pipeline corridors in both estuarine and marshland environments in Florida are evaluated. The discussion includes information on the survey of sediment deposits and terrestrial and marine life as applied to the selection of possible corridor routes. The potential impact of pipeline construction activity and the various techniques for monitoring the designation of sites as well as the projected completed pipelines are outlined. Details are given on remote sensing techniques for designating and monitoring pipeline corridors. (See also W76-11468) (Sinha - OEIS)
W76-11472

DEEPWATER PORTS: POLICY ISSUES IN FLORIDA,
Florida State Univ., Tallahassee Dept. of Urban and Regional Planning.
A. Dzurik.
In: Florida Coastal Policy Study: The Impact of Offshore Oil Development, December 1975. p 193-222, 3 tab, 1 map.

Descriptors: *Florida, *Continental Shelf, *Oil industry, *Resources development, Water resources, Water resources, *Environmental effects, Coasts, Facilities.
Identifiers: *Outer Continental Shelf, *Supertankers, *Deepwater ports, Refineries, Onshore facilities, Gas industry, Coastal Zone Management.

An overview of the possible use of supertankers off Florida's shores is provided. Policy issues associated with deepwater ports are specifically dealt with. It is concluded that the potential for deepwater port development is closely tied to the needs and expectations of the petroleum industry, but it is also subject to economic, legal and political constraints. Without major refineries, the development of deepwater ports is unlikely in Florida. (See also W76-11468) (Sinha - OEIS)
W76-11473

BUREAU OF LAND MANAGEMENT'S ENVIRONMENTAL STUDIES PROGRAM FOR THE SOUTH ATLANTIC OUTER CONTINENTAL SHELF AREA. CONFERENCE/WORKSHOP PROCEEDINGS,
Research Triangle Inst., Research Triangle Park, N. C.
Held at Atlanta, Georgia, October 1975, Published in February 1976. 283 p. Massoglia, M. F. (Compiler)

Descriptors: *Continental Shelf, *Resources development, *Environmental effects, *Baseline studies, *Water pollution, *Conferences, *Estuarine environment, Management, Geology, Fisheries, Alaska, Oceanography, Ecosystems, Biology, Physical properties, Land management.
Identifiers: *Outer Continental Shelf, South Atlantic OCS, U.S. Southeast Coast, Georgia Embayment, Georgia Bight, Environmental impact.

The objectives of the conference/workshop, 'Bureau of Land Management's Environmental Studies Program for the South Atlantic Outer Continental Shelf Area,' were: To provide a summary of available related information and understanding for the South Atlantic Outer Continental Shelf area. To provide any predictions presently possible of the effects of drilling (exploration and development) on the environment of this area. To identify subject areas in which additional information is required for reasonable prediction and understanding for the environmental effects of drilling in this area. And to formulate recommendations for baseline studies and monitoring which will help to adequately determine the environmental effects of any oil and gas exploration and development in the South Atlantic Outer Continental Shelf area. The report contains a compilation of presentation and discussions of the conference/workshop. Pertinent papers are separately abstracted. (See W76-11475 thru W76-11485) (Sinha - OEIS)
W76-11474

THE DEPARTMENT OF THE INTERIOR'S OUTER CONTINENTAL SHELF LEASING PROGRAM,
Bureau of Outdoor Recreation, Atlanta, Ga. Southeast Regional Office.
J. Whelan.
In: Bureau of Land Management's Environmental Studies Program for the South Atlantic Outer Continental Shelf Area, Conference/Workshop Proceedings, Feb 1976. p 11-14.

Descriptors: *Environmental effects, *Baseline studies, *Resources development, Leases, *Continental Shelf, *Oil industry, Water resources.
Identifiers: *Outer Continental Shelf, Environmental impact, Gas industry.

As a result of the OCS Lands Act of 1953, the Department of the Interior is responsible for managing and developing the mineral resources of the Outer Continental Shelf. The Department has formulated three major goals for the comprehensive management of the OCS. They are: Orderly development of marine mineral resources to meet the energy demands of the Nation; protection of the marine coastal environment; and receipt of fair market value for the leased mineral resources. The OCS Research Management Board was created in March 1974 by the Secretary to design and implement baseline environmental studies and data-gathering and monitoring activities relating to oil and gas development on the Outer Continental Shelf. Development of the energy resources on the OCS will provide substantial benefits to the entire country in terms of secure supplies of oil and gas. However, the Department does recognize that there are risks and potential costs associated with offshore development. (See also W76-11474) (Sinha-OEIS)
W76-11475

FRAMEWORK FOR BUREAU OF LAND MANAGEMENT PROGRAMS,
Bureau of Land Management, Washington, D.C. Outer Continental Shelf Environmental Studies Program.
F. C. Monastero.
In: Bureau of Land Management's Environmental Studies Program for the South Atlantic Outer Continental Shelf Area, Conference/Workshop Proceedings, Feb 1976. p 15-24.

Descriptors: *Environmental effects, *Baseline studies, *Resources development, *Oil industry, *Estuarine environment, *Wetlands, Land management, Leases, Management, Pipelines.
Identifiers: *Outer Continental Shelf, Environmental impact, Nearshore environments.

The Environmental Studies Project encompasses a wide variety of field, laboratory, and review stu-

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dies designed to gather information about the physical, chemical, biological, and geological aspects of the OCS, nearshore, and wetland/estuarine environments. It was established to support the BLM OCS-leasing program by providing data on which more informed management decisions could be based. Information from these studies can be (and is) used for tract selection, environmental impact statement (EIS) preparation, and preparation of special lease stipulations before leasing. After leasing, the data are used for assessing changes resulting from exploration and development activities; this information will affect operating orders, in the short turn, and, in the long turn, will be the basis for modification of leasing and operating regulations and for pipeline management. (See also W76-11474) (Sinha-OEIS)
W76-11476

SOUTHEAST COASTAL RESEARCH ACTIVITIES OF ERDA,
Division of Biomedical and Environmental Research (USERDA), Washington, D. C.
W. O. Forster.
In: Bureau of Land Management's Environmental Studies Program for the South Atlantic Outer Continental Shelf Area, Conference/Workshop Proceedings, Feb 1976. p. 29-37, 5 tab.

Descriptors: *Continental Shelf, *Ecosystems, *Resources development, *Oil industry, *Water resources, *Environmental effects, Leases, Land management, Coasts, Geology, Biology, Geochemistry, Oceanography, *Southeast U.S.
Identifiers: *Outer Continental Shelf, South Atlantic Coast, Georgia Bight.

The research program that ERDA is developing on the southeast coast is complimentary, not competitive with BLM's plans. The individual components of the overall southeast coastal program are the physical, the geochemical, the geological, and the biological programs. Each of the four programs has an emphasis on the time-related function aspect of the coastal zone as a system. The attempt is to describe the causes of such conditions. The geochemical transport program emphasizes the attempt to try to elucidate the causes of these particular parameters. The biological oceanography program is perhaps the most important of all. The impact of any activities in the coastal zone will have to be assessed in terms of the biological oceanographic aspect. The program that evolved is divided into five categories: hydrodynamic modeling; physical, geochemical, and biological oceanography; and the coordination of these projects. These studies must be multidisciplinary, laboratory, field, and experimental-ecosystems type. The environmental impacts will be greater with petroleum discharge and impacts on the nearshore area rather than offshore; therefore, highest priority for chronic effects studies should be in the nearshore zone. (See also W76-11474) (Sinha-OEIS)
W76-11477

THE ALASKAN OUTER CONTINENTAL SHELF ENVIRONMENTAL ASSESSMENT PROGRAM,
National Oceanic and Atmospheric Administration, Boulder, Colo. Outer Continental Shelf Environmental Assessment Program.
D. A. Wolfe.
In: Bureau of Land Management's Environmental Studies Program for the South Atlantic Outer Continental Shelf Area, Conference/Workshop Proceedings, Feb 1976. p 39-53, 2 fig.

Descriptors: *Continental Shelf, *Alaska, *Environmental effects, *Ecosystems, *Oil industry, *Baseline studies, *Resources development, Land management, Monitoring, Leases, Biology, Geology, Chemistry, Oceanography, Water resources.
Identifiers: *Outer Continental Shelf, Gas industry, Environmental impact.

The baseline studies for the Alaskan OCS are being managed for the Bureau of Land Management entirely by NOAA. NOAA is responsible for designing the research program, contracting for the research projects, monitoring progress, assuring quality of the data, and performing the analyses to be contained in the reports to BLM. The objectives of the Outer Continental Shelf Environmental Assessment Program are: Identify critical species, habitats, and processes and determine their susceptibility to petroleum development; identify sources and characterize them, including determination of the critical components of petroleum; quantify the transport mechanisms - concentrators, diffusers, and translators; quantify effects levels on individuals; relate the individual to his species and his species to the ecosystem, especially with intent to identify irreversible effects; develop and initiate a monitoring program based upon an understanding of the relations of biota to their physical environment; characterize the physical environment to provide data needed by licensing and regulatory agencies (Interior, Transportation) for judgment as to engineering design adequacy; provide timely input at all stages of BLM leasing and operations and provide timely assessment of alternatives; provide data format and storage such that data are easy to recover and amenable to analysis; and provide the best possible overall science while accomplishing the BLM mission. (See also W76-11474) (Sinha-OEIS)
W76-11478

ENVIRONMENTAL PROTECTION AGENCY'S ROLE, INTERESTS, AND RESPONSIBILITIES WITH RESPECT TO THE OUTER CONTINENTAL SHELF DEVELOPMENT,
Environmental Protection Agency, Johns Island, S. C. Office of Research and Development.
W. P. Davis.
In: Bureau of Land Management's Environmental Studies Program for the South Atlantic Outer Continental Shelf Area, Conference/Workshop Proceedings, Feb 1976. p 55-58.

Descriptors: *Continental Shelf, *Ecosystems, *Environmental effects, *Oil spills, Ecology, *Waste disposal, *Water quality control, *Resources development, Water resources, Land management, Management, Southeast U.S.
Identifiers: *Outer Continental Shelf, South Atlantic Coast, Georgia Bight, Georgia embayment, Environmental impact.

The U.S. Environmental Protection Agency's role with respect to OCS has been associated with efforts to develop a scientific basis for management decisions. Energy development and sound environmental interests need not be incompatible on the OCS issue. There are many ways in which EPA is directly or indirectly involved in the entire gamut of OCS operations in the broadest sense. EPA is concerned with ocean disposal; EPA performs an advisory role with respect to oil spills; the Narragansett Environmental Research Laboratory has the mission to supply scientific basis for establishment of marine water quality standards for petroleum; Gulf Breeze Environmental Research Laboratory has the mission to supply scientific basis for establishment of marine water quality standards for petroleum and in addition conducts work in the ecological effects of man-produced organic compounds in marine/estuarine ecosystems. Finally EPA has the responsibility to maintain one of the finest coastal areas of the United States. (See also W76-11474) (Sinha-OEIS)
W76-11479

OFFSHORE OPERATIONS, REGULATION AND ENVIRONMENTAL PROTECTION,
Exxon Co., New Orleans, La. Southeastern Div.
R. R. Hickman.
In: Bureau of Land Management's Environmental Studies Program for the South Atlantic Outer Continental Shelf Area, Conference/Workshop Proceedings, Feb 1976. p 63-68.

Descriptors: *Continental Shelf, *Environmental effects, *Resources development, *Oil industry, *Pollution abatement, Exploration, Operations, Drilling, Safety, Offshore platforms, Pipelines, Oil pollution
Identifiers: *Outer Continental Shelf, Gas industry, Offshore technology

In order to better understand the environmental impact of operations, the oil and gas industry has funded studies such as the recently completed 2-year Offshore Ecology Investigation undertaken by the prestigious Gulf Universities Research Consortium, with 23 principal scientists from 11 universities and two nonprofit research institutes participating, the study showed that there was no harm done in the 400 square nautical miles (1,370 sq km) study area off Louisiana despite the fact that extensive operations there have been going for more than 25 years. Seasonal changes resulted in a significantly greater variability in all of the data than could be ascribed to the presence or absence of petroleum operations. Offshore petroleum operations are providing important energy supplies to the United States. In all phases of this activity, including exploration, field development, and production, environmental protection is a key consideration. Protective measures include personnel training, elaborate safety equipment, automatic controls, and back-up equipment. An overall good record of past performance offshore will be enhanced in the future by continuing technological improvement, by effective regulation, and by the industry's determination to protect the environment wherever it operates. (See also W76-11474) (Sinha-OEIS)
W76-11480

OVERVIEW OF CONFERENCE PROGRAMS,
Skidaway Inst. of Oceanography, Savannah, Ga.
D. Menzel.
In: Bureau of Land Management's Environmental Studies Program for the South Atlantic Outer Continental Shelf Area, Conference/Workshop Proceedings, Feb 1976. p 93-96.

Descriptors: *Continental shelf, *Environmental effects, *Ecosystems, *Resources development, *Oil industry, *Pollution abatement, *Baseline studies, Exploration, Drilling, Leases, Land management, Southeast U. S.
Identifiers: *Outer Continental Shelf, *Gas industry, Environmental impact.

The guidelines of the conference are as follows: To provide a summary of available related information and understanding for portions of the southeast Continental Shelf; to provide any predictions presently possible on the effects of drilling (exploration and development) on the environment in this area; to identify subject areas in which additional information is required for reasonable prediction and understanding of the environmental effects of drilling; and to formulate recommendations for baseline and monitoring programs which will help to determine adequately the environmental effects of oil and gas exploration and exploitation in the South Atlantic Outer Continental Shelf region. The BLM is specifically concerned with the potential impacts of activities on and around drilling platforms, including any effect such activities might have on the surrounding ocean or shoreline. (See also W76-11474) (Sinha-OEIS)
W76-11481

GEOLOGICAL OCEANOGRAPHY CONSIDERATIONS,
Duke University, Durham, N. C.
O. H. Pilkey.
In: Bureau of Land Management's Environmental Studies Program for the South Atlantic Outer Continental Shelf Area, Conference/Workshop Proceedings, Feb 1976. p 97-101.

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scriptors: *Continental Shelf, *Geology, diments, *Sediment transport, *Environmental cts, *Resources development, *Seismic pro-ties, Water resources, Beaches, Estuaries, ling, Engineering structures, Safety, Oil indus-Pollution abatement, Leases, Southeast U. S.
ntifiers: *Outer Continental Shelf, South At-ic Coast, Georgia embayment, Georgia Bight, ke Plateau.

rief sketch of the geologic framework of the utheastern U. S. Continental Shelf is presented pertinent questions to be investigated in coor-tion with other baseline studies are given. The question is: What is the origin of the present sediment cover. The other questions are: at was the ultimate source of the sediment ering the Continental Shelf at the present time. at is being added to the sediment on the Con-ntal Shelf at the present time. What is happen-to the sand moving down rivers right now. re does new sand come from for the beaches the estuaries. How did the relict sand get onto Continental Shelf. What happens to the mud ing down the rivers at the present time. How is the unconsolidated sediment cover on the tinental Shelf in this area. How much lateral or nal mixing of sand or materials occurs on the inental Shelf. On a nonequilibrium shelf such e have here (i.e., a shelf covered by relict sedi-ts), what controls how grains move about lo-. What is the role of the Gulf Stream. What is ole of storms in moving about suspended sedi-and bottom sediment. How does material the shelf or margin enter the deep sea, that is, ff the Continental Shelf and the Blake Plateau ether. How about seismicity. What about the lity of manmade structures on the Continental ; How much sampling has already been done And where do we stand in terms of our un-anding of the geological framework. (See also 11474) (Sinha - OEIS)
11482

SICAL OCEANOGRAPHY CONSIDERA-IS,
Univ. System of Florida Inst. of Oceanog-, St. Petersburg.
nkel.
ureau of Land Management's Environmental es Program for the South Atlantic Outer Con-al Shelf Area, Conference/Workshop edings, Feb 1976. p 103-105.

iptors: *Continental Shelf, *Resources opment, *Oil industry, *Environmental ef-*Oil pollution, Pollution, Water pollution es, Drilling, Offshore platforms.
fiers: *Outer Continental Shelf, *Physical ography, *Bottom transport, Georgia Bight, ia Embayment.

ration and development has potential for ng contamination into the area. This con-ation is in two forms; temporary contami-from drilling operations and long-term con-nts from the rig itself or the material it on the bottom. Contaminants can enter the nment at the surface through water ns, but more importantly they probably at the bottom. Any data that can be used to t or model where instantaneous spills or in-neous and long-term contamination can become important. The problem is inter-inary in nature. Transport can be by organ-by absorption, or by almost any phenomena n pick up and move contaminants. It ap-hat there are not enough environmental data vide a good handle on the environmental in the area. If transport is considered to be in problem, there are not enough data to p good models or good prediction methods. e data from satellites and over-flights may ficient to generate a predictive ability for spills. The amount of bottom-current data gnificant, and yet, if you examine the ns that we are facing, bottom transport may be the most important thing we are looking at. (See also W76-11474) (Sinha - OEIS)
W76-11483

BIOLOGICAL CONSIDERATIONS,
Duke Univ., Beaufort, N. C. Marine Lab.
R. T. Barber.
In: Bureau of Land Management's Environmental Studies Program for the South Atlantic Outer Continental Shelf Area, Conference/Workshop Proceedings, Feb 1976. p 109-112.

Descriptors: *Continental Shelf, Ecology, *Environmental effects, *Oil spills, Ecosystems, Water pollution, *Resources development, *Baseline studies, *Advection, Shellfish, Fisheries, *Estuaries, Circulation, Nutrients, Biology, Beaches, Southeast U. S.
Identifiers: *Outer Continental Shelf, *Environmental impact, *Bottom transport, *Gulf Stream, South Atlantic Coast, Georgia embayment.

The Outer Continental Shelf of the South Atlantic region is dominated by advection, that is, the major property in determining the chemical and biological character of the water column is the horizontal along-shelf and cross-shelf circulation. Intermittent intrusions of deep water from the Gulf Stream onto the shelf produce a shoreward bottom current, which is the principal source of nutrients for the shelf community. The research necessary for establishing the baseline ecosystem character and predicting the ecosystem response to modification must be built around this time-varying advective character. The present idea of how the stock of the calico scallop fishery is maintained is that the adults off North Carolina are recruited from larvae spawned off the coast of Florida and carried north. The advective larval transport system, which the proposed lease area sits astride and which connects the Floridian fauna to its further extensions off the coasts of Georgia, South Carolina, and North Carolina, is clearly the most vulnerable component of the ecosystem and the one most likely to be impacted by the proposed development. A spill or accident occurring in the absence of a Gulf Stream intrusion may be diluted and advected out of the system without detectable impact on the biota, while the same event occurring during a period of strong bottom flow across the shelf or during a period of strong onshore winds could product marked effects over a wide zone projecting from the spill site shoreward as far as the beach or estuary. (See also W76-11474) (Sinha-OEIS)
W76-11484

CONCLUSION AND RECOMMENDATIONS CONFERENCE/WORKSHOP,
Skidaway Inst. of Oceanography, Savannah, Ga.
D. Menzel.
In: Bureau of Land Management's Environmental Studies Program for the South Atlantic Outer Continental Shelf Area, Conference/Workshop Proceedings, Feb 1976. p 227-250.

Descriptors: *Continental Shelf, *Resources development, *Environmental effects, *Oil pollution, *Metals, *Ecosystems, *Water pollution effects, *Oil industry, Hazards, Geology, Biology, Oceanography, Meteorology, Safety, Leases, Conferences, Land management, Biota, Fisheries, Southeast U. S.
Identifiers: *Outer Continental Shelf, *Hydrocarbons, Georgia Embayment, South Atlantic Coast, Georgia Bight.

Conclusions and recommendations developed by the conference/workshop are summarized and discussed. There was a charge from the floor to establish study priorities based on possible impacts, which might exert a long-term effect on man or an irreversible effect on the environment. The following concerns were considered of major importance. (1) The possibility of accidents resulting from geological hazards; (2) Permanent destruction of unique environments; and (3) The effects of metals and hydrocarbons on organisms and the possible return of these elements/compounds to man. In keeping with the conclusions, it was determined that the recommendations developed in the individual workshops should be prioritized by considering the direct impact on man and the environment of any oil and gas development activities; weighting them according to the irreversibility of the impact; and assembling them into interdisciplinary packages. Within this general framework three priority groups were defined. Baseline, Direct Impact on Man: seismology and identification of faults and positions of aquifers, and test drillings to correlate with such a study; side-scan sonar mapping to identify hard bottom areas; inventory of metals and hydrocarbons in water, animals, and sediments; inventories of seasonal abundance of birds, mammals, and reptiles; inventories of benthic organisms in direct support of same locations; trajectories and net transport of water; management of background and historical data; coordination of activities associated with fish populations currently being conducted by Federal, State and private agencies; beach survey for tarballs; and chemistry of suspended particulates. Predictive Studies: fate of oil in marshes, shelf, and open ocean; and fate of metals in marshes, shelf, and open ocean. The third group contains all others. (See also W76-11474) (Sinha-OEIS)
W76-11485

AN ENVIRONMENTAL ASSESSMENT OF IMPACTS OF COAL DEVELOPMENT ON THE WATER RESOURCES OF THE YAMPA RIVER BASIN, COLORADO AND WYOMING--PHASE-II WORK PLAN,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 5C.
W76-11500

FEATURES OF FRESHWATER ECOSYSTEMS (FROM THE RESULTS OF SOVIET PARTICIPATION IN THE INTERNATIONAL BIOLOGICAL PROGRAM), (IN RUSSIAN),
Akademiya Nauk SSSR, Leningrad. Zoologicheskii Institit.
For primary bibliographic entry see Field 5C.
W76-11556

A PRACTICAL DATA MANAGEMENT SYSTEM FOR MONITORING AND MANAGING LARGE DISTRIBUTED ECOSYSTEMS,
Michigan State Univ., East Lansing. Dept. of Electrical Engineering and Systems Science.
For primary bibliographic entry see Field 5G.
W76-11608

IMPACT OF WATER SUPPLY AND WASTEWATER ON THE COASTAL AND MARINE ENVIRONMENTS,
North Carolina State Univ., Raleigh. Sea Grant Program.
For primary bibliographic entry see Field 5D.
W76-11625

7. RESOURCES DATA

7A. Network Design

THE ENVIRONMENTAL INFORMATION SYSTEM (EIS) IN SWEDEN AND MONITORING OF THE ENVIRONMENT,
Swedish Council of Environmental Information, Stockholm. Jordbruksdepartementet.
For primary bibliographic entry see Field 5A.
W76-11241

THE NATIONAL STREAM QUALITY ACCOUNTING NETWORK,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 5A.
W76-11419

DECISION THEORY AND ITS APPLICATION TO NETWORK DESIGN,
Geological Survey, Reston, Va.
M. E. Moss.
In: Hydrological Network Design and Information Transfer; Proceedings of international seminar, held at Newcastle upon Tyne, U K, August 19-23, 1974: World Meteorological Organization Operational Hydrology Report No 8 (WMO No 433), p 23-25, 1976. 8 ref.

Descriptors: *Network design, *Data collections, *Statistical methods, *Decision making, Methodology, Regression analysis, Probability, Optimization.
Identifiers: *Bayes theorem, Subjective probabilities.

A brief description of the pros and cons of the use of classical statistics (non-Bayesian) in network design is presented. In classical statistics, the statistician is not concerned with the eventual decision that may be based on the results of an analysis. The classicist applies a rigorously derived formulation to an existing set or sets of data and might state something to the effect that at the 95 percent confidence level there is no difference between the means from which two samples were drawn, or he might state that there is a probability of 99 percent that the true mean from which a sample was drawn lies between two particular values. The classicist can specify the types of tests used in his analysis and provide another statistician with his data and the two will obtain exactly the same results. Thus classical statistics is both rigorous and reproducible and, if it is used to formulate network design strategies, each designer would arrive at the same network if all used the same data. On the other hand, if classical statistics are used in network design, the ultimate goal of providing optimum levels of information is in all likelihood not reached because the uses to which the data will be put are not incorporated into the procedure. Surrogate measures such as conficence bands or accuracy statements become the parameters of the design criteria. (Woodard-USGS)
W76-11498

INFORMATION TRANSFER FOR STREAM DISCHARGE,
Geological Survey, Reston, Va.
M. E. Moss.
In: Hydrological Network Design and Information Transfer; Proceedings of international seminar, held at Newcastle upon Tyne, U K, August 19-23, 1974: World Meteorological Organization Operational Hydrology Report No 8 (WMO No 433), p 119-128, 1976. 2 fig, 3 tab, 7 ref.

Descriptors: *Network design, *Flow characteristics, *Gaging stations, *Regression analysis, Estimating streamflow, Sites, Probability, Optimization, Computer programs.
Identifiers: *Ungaged stream sites.

The need for mechanisms by which information pertaining to streamflow can be transferred from one or more sites to sites at which little or no data are available becomes obvious if it is technically impossible to perfectly anticipate demands for streamflow information, and economically impossible to gauge at every conceivable site. Network design by the use of regression-analysis simulation is thus a viable tool that can be considered in the expansion of existing streamflow-data networks. At present, however, the method cannot be applied in areas where existing data are not sufficient to perform an initial regression analysis because of lack of knowledge concerning the underlying model errors contained in the regression. Plans are under way to remedy this by posterior analysis of the results obtained using the method in the United States and elsewhere in the world. An additional limitation may arise when the existing catalogue does not cover the range of parameters required for the system under examination. Under such a circumstance computer programs can be made available for the extension of the catalogue. These extended results can be added to existing catalogues so as to minimize the likelihood that future users will encounter such limitations. (Woodard-USGS)
W76-11499

7B. Data Acquisition

VEGETATION MAPPING IN LAKE CHAMPLAIN WETLANDS,
Vermont Univ., Burlington. Dept. of Geography.
For primary bibliographic entry see Field 4A.
W76-11111

COMPARISON OF METHODS FOR ESTIMATING POTENTIAL EVAPOTRANSPIRATION IN THE NORTH PLATTE BASIN OF WYOMING,
Wyoming Univ., Laramie. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2D.
W76-11115

DESIGN OF POLLUTANT ORIENTED INTEGRATED MONITORING SYSTEMS,
Environmental Protection Agency, Las Vegas, Nev.
E. A. Schuck, and G. B. Morgan.
In: International Conference on Environmental Sensing and Assessment, Vol. 2, September 14-19, 1975, Las Vegas, Nevada, p 20-6-1 - 20-6-6. 8 fig, 11 ref.

Descriptors: *Monitoring, *Systems analysis, *Water pollution effects, *Lead, *Flow, *Water pollution sources, Path of pollutants, Runoff, Analytical techniques, Evaluation.

The use of an integrated monitoring systems approach for assessing the sources and environmental impact of specific pollutants is discussed. The integrated monitoring systems approach simultaneously takes into account the critical receptors, critical transport pathways, and critical sources. The use of the integrated monitoring systems approach for illustrating the flow of lead from sources through various environmental pathways and its interaction with a critical receptor (an urban child under 6 years of age) revealed that lead from drinking water sources represents a minor contribution to exposure, except in small isolated areas, since most of the particulate lead in the environment is largely in an insoluble form. A flow diagram of the fate of lead contributed from an automotive fleet reveals that street runoff into coastal waters accounts for only about 2% of the total lead emitted. The application of the integrated concept to the test case demonstrated the inability of conventional chemical and physical methods for monitoring total exposure of a critical receptor. (See also W76-10637) (Kreager-FIRL)
W76-11238

THE MEANING AND MEASUREMENT OF TURBIDITY,
National Oceanographic Instrumentation Center, Washington, D.C.
For primary bibliographic entry see Field 5A.
W76-11240

GREAT LAKES TEMPERATURE MAPS BY SATELLITE,
National Environmental Satellite Service, Washington, D. C.
For primary bibliographic entry see Field 2H.
W76-11300

SELECTED SATELLITE DATA ON SNOW AND ICE IN THE GREAT LAKES BASIN 1972-73,
National Environmental Satellite Service, Washington, D C.
For primary bibliographic entry see Field 2C.
W76-11301

PROGRAMMABLE CALCULATORS: MODERN INSTRUMENTS FOR ANALYZING HYDROLOGIC DATA,
Geological Survey, Tallahassee, Fla.
D. V. Maddy.
Open-file report 75-642, December 1975. 24 p, 15 fig, 2 ref.

Descriptors: *Data processing, *Data collections, *Hydrologic data, *Data transmission, *Systems analysis, Surface water, Groundwater, Hydrology, Data storage and retrieval, Instrumentation, Telemetry.
Identifiers: *Programmable calculators.

The programmable calculator has become a valuable addition to the set of modern instruments that a hydrologist has at his disposal for the analysis of hydrologic data. The programmable calculator may be used to compute discharge measurements, to compute daily discharges from gage heights and shifts, to compute duration values, to compute discharge of flow through a venturi constriction, to compute values of production and respiration for oxygen metabolism studies, and to perform many other data analysis tasks. The programmable calculator can store and retrieve various kinds of data, can prepare summary tables of ground-water and surface-water elevations, and can plot graphs of various parameters. The programmable calculator's versatility is almost unlimited and allows data handling on a current basis. (Woodard-USGS)
W76-11416

WATER CURRENT FORCE MEASURING APPARATUS,
S. J. Niskin.
U. S. Patent No. 3,955,412, 3 p, 4 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 946, No 2, p 497, May 11, 1976.

Descriptors: *Patents, *Currents(Water), *Water circulation, *Water level fluctuations, Ocean currents, Current meters, Tidal effects, Cycles, Strain gages, Strain measurement, Instrumentation, Energy, Kinetics.

A water current force measuring apparatus consists of a pliable rope or line suspended in the water with its lower end anchored to the bottom while the length of the line is subjected to the forces of the current. The upper end of the line is secured to a tensiometer or strain gauge, which in turn is connected to a float or a series of interconnected buoys or floats. Those floats that submerge, balance the total horizontal current-generated force or drag on the line, which is recorded on the tensiometer. These readings are a measure of the total current forces acting on the line by the surface and subsurface currents to permit the ready determination of the total kinetic energy of the currents. Upon obtaining continuous readings of the strain gauge over a definite period, wave heights and lenghts,as well as tidal and other cyclic and non-cyclic water movements of the body of water can be ascertained. (Sinha - OEIS)
W76-11444

GEOPHYSICAL PROSPECTING FOR GROUND WATER IN ALASKA,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 4B.
W76-11496

IE POTENTIAL IMPACT OF SATELLITE
TA-RELAY SYSTEMS ON THE OPERATION
HYDROLOGIC DATA PROGRAMS,
ological Survey, Reston, Va. ; and Geological
rvey, Bay Saint Louis, Miss.
W. Moody, and D. M. Preble.
Water for Human Needs; Proceedings of the
cond World Congress on Water Resources,
lume V, held in New Delhi, India, December
16, 1975: Published by C.V.J. Varma, Indian
mmittee for International Water Resources As-
iation, p 261-273, 7 fig, 2 tab, 17 ref.

scriptors: *Network design,
tellite(Artificial), *Telemetry, *Hydrologic
a, *Planning, Evaluation, On-site investigation,
sts, Data collections, Monitoring, Methodolo-

ntifiers: *Satellite data-relay systems.

eview is presented of the operation of a non-
metered hydrologic data collection system and
ntifies work elements which will be affected by
metry. Estimated costs and the performance of
-telemetered stations are compared with those
tations telemetered via land-line, line-of-sight
o, meteor burst, and satellite communication
s. It is concluded that the total costs of a large
vork of automatic hydrologic data collection
ions, whose data are transmitted via satellite to
ntral station, are comparable to the total costs
non-telemetered network. Because of their ex-
ive geographic coverage, satellite systems will
an important part on the design and operation
uture water resource management systems and
al environmental monitoring programs.
odard-USGS)
-11497

IMPLE AND RAPID METHOD OF SOIL
TER DETERMINATION,
achal Pradesh Univ., Palampur (India). Coll.
griculture.
primary bibliographic entry see Field 2D.
-11506

Evaluation, Processing and Publication

ENVIRONMENTAL INFORMATION
TEM (EIS) IN SWEDEN AND MONITORING
HE ENVIRONMENT,
dish Council of Environmental Information,
kholm. Jordbruksdepartementet.
primary bibliographic entry see Field 5A.
-11241

IRONMENTAL INDICES AND MONITOR-

rtment of the Environment, Ottawa
rio). Science Policy Branch.
rimary bibliographic entry see Field 5A.
11245

ARDS A COMPUTER-BASED INFORMA-
MONITORING SYSTEM FOR GROUND-
ER DATA IN NEW ZEALAND,
is Univ. at Chicago Circle. Dept. of Geologi-
iences.
rimary bibliographic entry see Field 4B.
11247

ROPOLITAN TORONTO'S APPROACH TO
ENTATIVE MAINTENANCE FOR
TMENT PLANTS,
politan Toronto Dept. of Works, (Ontario).
and Pollution Control Directorate.
rimary bibliographic entry see Field 5F.
1255

GREAT LAKES TEMPERATURE MAPS BY SATELLITE,
National Environmental Satellite Service, Washington, D. C.
For primary bibliographic entry see Field 2H.
W76-11300

COMPUTER PROGRAM FOR THREE-DIMENSIONAL PLOTTINGS FROM IRREGULAR FINITE ELEMENT GRID,
California Univ., Davis. Dept. of Land, Air and Water Resources.
For primary bibliographic entry see Field 2F.
W76-11327

FLOOD PLAIN INFORMATION: KASKASKIA RIVER, BEAR CREEK, LAKE FORK CREEK, WEST FORK CREEK AND 'A' CREEK, DOUGLAS COUNTY, ILLINOIS, NO. 1.
Army Engineer District, St. Louis, Mo.
For primary bibliographic entry see Field 4A.
W76-11341

FLOOD PLAIN INFORMATION: LAKE MONROE, NEAR SANFORD, FLORIDA.
Army Engineer District, Jacksonville, Fla.
For primary bibliographic entry see Field 4A.
W76-11342

FLOOD PLAIN INFORMATION: NORTHEAST VOLUSIA COUNTY, FLORIDA.
Army Engineer District, Jacksonville, Fla.
For primary bibliographic entry see Field 4A.
W76-11343

FLOOD PLAIN INFORMATION: SWIFT CREEK, MACON AND BIBB COUNTY, GEORGIA.
Army Engineer District, Savannah, Ga.
For primary bibliographic entry see Field 4A.
W76-11344

FLOOD PLAIN INFORMATION: WAYCROSS DRAINAGE CANAL, WAYCROSS AND WARE COUNTY, GEORGIA.
Army Engineer District, Savannah, Ga.
For primary bibliographic entry see Field 4A.
W76-11345

FLOOD PLAIN INFORMATION: BUCK CREEK AND GRASSY CREEK, MARION COUNTY, INDIANA,
Army Engineer District, Louiville, Ky.
For primary bibliographic entry see Field 4A.
W76-11346

FLOOD PLAIN INFORMATION: KENAI RIVER, PHASE II, KENAI PENINSULA BOROUGH, ALASKA,
Army Engineer District, Anchorage, Alaska.
For primary bibliographic entry see Field 4A.
W76-11347

FLOOD PLAIN INFORMATION: FISHER CREEK, SANTA CLARA COUNTY, CALIFORNIA,
Army Engineer District, San Francisco, Calif.
For primary bibliographic entry see Field 4A.
W76-11348

FLOOD PLAIN INFORMATION: ALAMITOS CREEK, INCLUDING GUADALUPE CREEK-ARROYO CALERO AND SANTA TERESA CREEK, SANTA CLARA COUNTY, CALIFORNIA,
Army Engineer District, San Francisco, Calif.
For primary bibliographic entry see Field 4A.
W76-11349

FLOOD PLAIN INFORMATION: DEER CREEK AND WHITE RIVER, EARLIMART, CALIFORNIA,
Army Engineer District, Sacramento, Calif.
For primary bibliographic entry see Field 4A.
W76-11350

FLOOD PLAIN INFORMATION: GREEN VALLEY, DAN WILSON, AND SUISUN CREEKS, CORDELIA, CALIFORNIA.
Army Engineer District, Sacramento, Calif.
For primary bibliographic entry see Field 4A.
W76-11351

FLOOD PLAIN INFORMATION: CACHE LA POUDRE RIVER, COLORADO, VOL. III. FORT COLLINS-GREELEY-LARIMER-WELD COUNTY.
Army Engineer District, Omaha, Nebr.
For primary bibliographic entry see Field 4A.
W76-11352

FLOOD PLAIN INFORMATION: WABASH RIVER, MIAMI COUNTY AND PERU, INDIANA.
Army Engineer District, Louisville, Ky.
For primary bibliographic entry see Field 4A.
W76-11353

FLOOD PLAIN INFORMATION: POGUES RUN, PLEASANT RUN, AND BEAN CREEK, MARION COUNTY, INDIANA.
Army Engineer District, Louisville, Ky.
For primary bibliographic entry see Field 4A.
W76-11354

FLOOD PLAIN INFORMATION: LICK CREEK AND LITTLE BUCK CREEK, MARION COUNTY, INDIANA.
Army Engineer District, Louisville, Ky.
For primary bibliographic entry see Field 4A.
W76-11355

FLOOD PLAIN INFORMATION: LITTLE ARKANSAS RIVER AND SAND CREEK, SEDGWICK, KANSAS.
Army Engineer District, Tulsa, Okla.
For primary bibliographic entry see Field 4A.
W76-11356

FLOOD PLAIN INFORMATION: BIG SANDY RIVER, BOYD COUNTY, KENTUCKY.
Army Engineer District, Huntington, W. Va.
For primary bibliographic entry see Field 4A.
W76-11357

FLOOD PLAIN INFORMATION: QUINEBAUG RIVER - CADY BROOK, TOWN OF SOUTHBRIDGE, MASSACHUSETTS.
Army Engineer District, Waltham, Mass.
For primary bibliographic entry see Field 4A.
W76-11358

FLOOD PLAIN INFORMATION: MERRIMACK RIVER, CITY OF CONCORD, NEW HAMPSHIRE.
Army Engineer District, Waltham, Mass.
For primary bibliographic entry see Field 4A.
W76-11359

FLOOD PLAIN INFORMATION: ALUM CREEK, VICINITY OF COLUMBUS, OHIO.
Army Engineer District, Huntington, W. Va.
For primary bibliographic entry see Field 4A.
W76-11360

LIBRARY U. OF I. URBANA-CHAMPAIGN

FLOOD PLAIN INFORMATION: SOUTH FORK RIVANNA RIVER, ALBEMARLE COUNTY, VIRGINIA.
Army Engineer District, Norfolk, Va.
For primary bibliographic entry see Field 4A.
W76-11361

SOURCES OF WATER QUALITY, LAKE LEVEL, ICE, WATER TEMPERATURE, AND METEOROLOGICAL DATA FOR THE ST. LAWRENCE GREAT LAKES,
Wisconsin Univ., Milwaukee. Center for Great Lakes Studies.
A. M. Beeton, and J. W. Strand.
University of Wisconsin-Milwaukee (Wisconsin), Advisory Report No. 10, 193 p, January, 1975. 5 fig, 8 ref, 5 tab.

Descriptors: *Great Lakes, *Hydrologic data, *Meteorological data, Stations, *Data collections, *Water quality, Canada, United States, Weather data, On-site data collections, Intakes, Water chemistry, Lake Superior, Lake Michigan, Lake Ontario, Lake Huron, Lake Erie, Weather data, Chemical properties, Physical properties, Biological properties, Sampling.

This 2-part report lists data sources around the Great Lakes (in both Canada and the United States) collecting hydrographic and meteorological data. Data sources for hydograghic information are municipal, industrial, power plant, and military water treatment plants. The hydrographic section identifies the data source (along with address, telephone number, and person to contact), gives information on the physical structure of the water intake, indicates what specific chemical, physical, biological, and radiological measurements are made on the raw (untreated) water, shows the period of record, and the availability of the data. The meterological section lists weather stations around the Great Lakes up to a distance of 125 miles inland and their location (latitude and longitude) and elevation, agency to contact when requesting data, period of record, and type of data collected (e.g., air temperature, relative humidity, precipitation, solar radiation). (Witt-IPC)
W76-11363

STATISTICAL SUMMARIES OF INDIANA STREAMFLOW DATA,
Geological Survey, Indianapolis, Ind.
R. G. Horner.
Water-Resources Investigations 35-75, February 1976. 526 p, 1 fig, 2 tab, 13 ref.

Descriptors: *Streamflow, *Basic data collections, *Hydrologic data, *Indiana, *Gaging stations, Discharge(Water), Flow rates, Flow characteristics, High flow, Low flow, Average flow, Peak discharge, Annual, Monthly.

Complete statistical streamflow analyses are presented in tabular form for all gaging stations in Indiana, regardless of length of record. Each station analysis includes lowest and highest mean daily discharges, flow duration, and annual peak discharges. Statistics also are given on normal monthly means, normal annual means, log monthly means, and log annual means. (Woodard-USGS)
W76-11409

GROUND-WATER RECORDS FOR NORTHEASTERN OKLAHOMA: PART 1--RECORDS OF WELLS, TEST-HOLES, AND SPRINGS,
Geological Survey, Oklahoma City, Okla.
J. S. Havens, and D. L. Bergman.
Open-file report, March 1976. 100 p, 33 ref.

Descriptors: *Groundwater, *Basic data collection, *Water wells, *Well data, Test wells, Springs, Aquifers, Water yield, Water levels, Water utilization, Bibliographies, Publications, *Oklahoma.
Identifiers: Northeastern Oklahoma.

The U. S. Geological Survey has collected data on Oklahoma's ground-water resources since 1934. Most of these data were collected as part of specific ground-water studies conducted in cooperation with various Federal, State, and local agencies. This report includes published and unpublished records of approximately 3,360 wells, test-holes, and springs for 23 counties in northeastern Oklahoma. In addition, selected references to pertinent ground-water reports covering parts of the 23-county area are presented. (Woodard-USGS)
W76-11412

HYDROLOGIC DATA FOR URBAN STUDIES IN THE SAN ANTONIO, TEXAS METROPOLITAN AREA, 1974,
Geological Survey, Austin, Tex.
V. Gonzalez.
Open-file report, May 1976. 109 p, 1 fig, 5 tab.

Descriptors: *Storms, *Rainfall-runoff relationships, *Water quality, *Small watersheds, *Urban runoff, Texas, Hydrologic data, Streamflow, Rain gages, Gaging stations, Peak discharge, Path of pollutants, Chemical analysis, Hydrographs, Mass curves.
Identifiers: *San Antonio(Tex).

Runoff data from the San Antonio urban study area for the 1974 water year are based on discharge measurements and stage records at six continuous-record stream-gaging stations, seven crest-stage partial-record stations (flood hydrographs obtained), and water-surface elevations at eleven flood-profile partial-record stations. Storms producing the highest peak discharges in the San Antonio metropolitan area occurred on the following days: Oct. 11, 1973, and Aug. 8, 30, 1974. Weighted rainfall for these storm periods upstream from continuous-record gaging stations and selected crest-stage partial-record stations are given. Water-quality data have been collected from watersheds in various stages of urban development at most of the gaging stations in the San Antonio urban area. This water-quality program provides data on the concentration of pollutants as a result of runoff from these watersheds. In addition these data provide a relationship of water-quality parameters to discharge and seasonal conditions. (Woodard-USGS)
W76-11413

HYDROLOGIC RECORDS FOR LAKE COUNTY, FLORIDA, 1973-74,
Geological Survey, Tallahassee, Fla.
C. P. Laughlin, and D. M. Hughes.
Open-file report FL 75013, 1975. 72 p, 37 fig, 22 tab, 7 ref.

Descriptors: Water resources, *Basic data collections, *Surface waters, *Groundwater, *Water quality, Streamflow, Hydrogeology, Aquifer characteristics, Water wells, Water levels, Hydrologic data, Lakes, Chemical analysis, *Florida.
Identifiers: Lake County(Fla).

A hydrologic records program was begun in 1969 by the U. S. Geological Survey in cooperation with the Lake County (Florida) Board of County Commissioners, and the Oklawaha Basic Recreation and Water Conservation and Control Authority. This is the fifth annual report for the hydrologic records program; it presents and summarizes the data for 1973-74 in both tabular and graphic form. Included are stream discharge records for two water years plus a three month period (October 1, 1972 to December 1974) and groundwater and lake levels, and water quality data for May 1973 through December 1974. Also included are water levels in approximately 60 wells measured each May to obtain data for annual preparation of maps of the potentiometric surface of the Florida aquifer. A map of the potentiometric surface of the Floridan aquifer in the Leesburg area on M 17, 1974 is presented. Additional hydrologic d are included from cooperative programs betw the U. S. Geological Survey and the Southw Florida Water Management District, and Florida Department of Natural Resour (Woodard-USGS)
W76-11414

PROGRAMMABLE CALCULATORS: MODE INSTRUMENTS FOR ANALYZI HYDROLOGIC DATA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 7B.
W76-11416

THE NATIONAL STREAM QUALITY COUNTING NETWORK,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 5A.
W76-11419

OBJECTIVE ANALYSIS OF IFYGL SURF METEOROLOGICAL DATA,
National Oceanic and Atmospheric Admini tion, Washington, D. C.
For primary bibliographic entry see Field 2H.
W76-11435

THE ATMOSPHERIC BUDGETS PROGRAM IFYGL,
National Oceanic and Atmospheric Admini tion, Washington, D. C. Environmental Data vice.
For primary bibliographic entry see Field 2H.
W76-11436

DOCUMENTATION FOR ES001. A STEA STATE, ONE DIMENSIONAL, ESTUA WATER QUALITY MODEL,
Environmental Protection Agency, New York gion II.
For primary bibliographic entry see Field 5B.
W76-11460

WICHITA FALLS INTEGRATED MUNICI INFORMATION SYSTEM, WATER UTI PROCESSING SYSTEM (WUPS), APPL TION COMPLETION REPORT, VOLUME I
For primary bibliographic entry see Field 3D.
W76-11596

WICHITA FALLS INTEGRATED MUNICI INFORMATION SYSTEM, WATER UTI PROCESSING SYSTEM (WUPS), APPL TION COMPLETION REPORT, VOLUME I
For primary bibliographic entry see Field 3D.
W76-11597

MODELING SOLUTE TRANSPORT GROUND WATER,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 5B.
W76-11605

AN IMPROVED MODEL FOR ANALYSI AIR AND WATER POLLUTION DATA,
Environmental Protection Agency, Las V Nev. Office of Research and Development.
For primary bibliographic entry see Field 5B.
W76-11606

DATA MANAGEMENT: KEY TO ENVI MENTAL QUALITY ASSESSMENT,
National Oceanic and Atmospheric Admin tion, Washington, D. C. Environmental Dat vice.
For primary bibliographic entry see Field 5G.

6-11607

E ROLE OF ENVIRONMENTAL DATA
NKS IN ENERGY RESOURCE DEVELOP-
NT,
ntucky Univ., Lexington. Inst. for Mining and
erals Research.
primary bibliographic entry see Field 5G.
6-11609

IPLE TRACKING DATA MANAGEMENT
TEM,
ironmental Monitoring and Support Lab., Las
as, Nev.
. Snelling, M. J. Madsen, and G. C. Allison.
International Conference on Environmental
ing and Assessment, Vol. 2, September 14-19,
, Las Vegas, Nev., p 31-3-1-31-3-4. 3 fig, 1 tab.

criptors: *Quality control, *Computer pro-
s, *Data collections, *Tracking techniques,
ytical techniques, Data processing, Data
ge and retrieval.

stem for tracking laboratory samples of water
other materials through their respective
ses to completion is described. The system,
h is known as the Sample Tracking Data
agement System, provides for the storage and
eval of data from a direct access master file.
e input side, sample identification and collec-
data are entered through the use of a sample
er information card and a location description
mation card. The system allows for the inter-
g of laboratory analytical programs directly
the master file for the purpose of retrieving
ed sample collection information. Analytical
cards are generated for direct reentry into
ata management system. On the output side
e system, data summaries may be generated
ly from the master file. Working files may
e created for utilizing special purpose appli-
programs such as dose models, plotting,
uring, and statistical analysis. The sample
ng module of the system provides a tool to
gement for evaluating and controlling the
atory operations function by providing sam-
tatus information. (See also W76-10637)
ger-FIRL)
1611

ITY CONTROL AND HARMONIZATION
RAMMES FOR THE ASSESSMENT OF
CTS AND THE MEASUREMENT OF EN-
NMENTAL POLLUTION IN THE EU-
AN COMMUNITIES,
ission of the European Communities, Lux-
rg. Health Protection Directorate.
imary bibliographic entry see Field 5G.
1613

DATION OF ENVIRONMENTAL MEA-
MENT METHODOLOGY,
nmental Monitoring and Support Lab., Cin-
, Ohio.
mary bibliographic entry see Field 5A.
1614

NGINEERING WORKS

Hydraulics

IZATION OF WATER DISTRIBUTION
ORK SYSTEMS,
(Roy F.), Inc., West Chester, Pa.
eb.
of the Environmental Engineering Divi-
roceedings of the American Society of Civil
ers, Vol. 102, No. EE4, Proceedings paper
837-851, August 1976. 8 fig, 30 equ, 12 ref.

Descriptors: *Water distribution(Applied), *Pipes, *Networks, *Optimization, *Costs, *Hazen-Williams equation, *Environmental engineering, Design, Pipe flow, Economics, Hydraulics, Computer programs, Systems analysis.
Identifiers: Cost minimization.

A new method for a workable optimum cost solution of pipe sizes of various branches of a water distribution network with given geometry, peak demand values, and specified terminal pressure heads has been developed incorporating pipe cost function. A correction factor for flow has also been derived which, when algebraically added successively to the assumed flow values of pipes in a loop during an iteration process, results in convergence towards the solution. As theoretical least-cost solution results in the formation of a tree network, a workable optimum condition has been considered by fixing a minimum size of pipes. The integrated total cost of the system including capital and recurring cost of pumping station, elevated reservoir, and pipes has been optimized to obtain optimum inlet pressure head, pressure surface, and position of elevated reservoir for a given network. The applicability of the approach, which utilizes the Hazen-Williams equation, is illustrated with a problem. The effect of the density of population on the cost has been studied and a general computer program developed. (Bell-Cornell)
W76-11133

GROYNE STABILIZATION OF SLOPE MOVEMENTS AND TOE EROSION, LAKE HURON NEAR BAYFIELD, ONTARIO,
University of Western Ontario, London. Dept. of Civil Engineering.
R. M. Quigley, J. H. L. Palmer, A. Rowland, and D. Bere.
In: Proceedings, Seventeenth Conference on Great Lakes Research, Part 1; McMaster University, Hamilton (Ontario), August 12-14, 1974. International Association for Great Lakes Research, p 193-206, 1974. 9 fig, 12 ref.

Descriptors: *Groins(Structures), *Gabions, *Shore protection, *Lake Huron, Structures, Hydraulic structures, Jetties, Beaches, Beach erosion, Berms, Erosion, Erosion control, Waves(Water), Coasts, Coastal structures, Shores, Engineering.
Identifiers: *Bayfield(Ontario).

The storm of March 17, 1973 caused very severe erosion at many places along the east coast of Lake Huron. Subsequent spring wave action continued to attack the toe of many 17 m high cliffs resulting in numerous landslides, many of them encroaching on valuable cottage properties. This paper described the layout, installation, and first year performance of a system of three gabion groynes set up to protect a 122 m long section of coast already subject to severe earth movements. In the absence of adequate design information, the design was based on preliminary wind data and field observations of beach characteristics, sand availability and probable wave heights. The groynes, which were constructed during June and July 1973, were spaced about 36 m apart and extended off-shore from the cliff toe for a distance of about 18 m. The ends of the groynes, therefore, extend to the plunge point of 1.2 m high waves generated by strong trade winds and about 60% of the distance to the estimated location of the plunge point of severe storms. The beach height at the cliff toe has built itself up to 1.8 m above present water levels and provides a beach berm just adequate to stabilize the lower portions of the failing cliff behind it during the wet spring conditions of 1974. The installation has been very successful, the groynes having rapidly filled with sand and gravel. The groyne field and resultant beach prevented spring time erosion during the period from March to May 1974 and is presently considered to be performing successfully. (See also W76-11275) (Sims - ISWS)
W76-11290

HELMHOLTZ RESONANCE IN HARBOURS OF THE GREAT LAKES,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 2H.
W76-11306

FIELD OBSERVATIONS OF THE DYNAMICS OF HEATED DISCHARGE JETS,
Argonne National Lab., Ill. Energy and Environmental Systems Div.
For primary bibliographic entry see Field 5B.
W76-11307

A NUMERICAL MODEL FOR THERMAL PLUMES AND RIVER DISCHARGES,
Case Western Reserve Univ. Cleveland, Ohio. Dept. of Earth Sciences.
For primary bibliographic entry see Field 5B.
W76-11310

BENEATH THE TENN-TOM,
Geological Survey, Nashville, Tenn.
For primary bibliographic entry see Field 4A.
W76-11415

TRANSVERSE DISPERSION IN PARTIALLY STRATIFIED TIDAL FLOW,
California Univ., Berkeley. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2L.
W76-11486

HYDRAULIC MODEL STUDIES OF MECHANICAL MIXING DEVICES IN STRATIFIED LAKES,
Oklahoma State Univ., Stillwater. School of Mechanical and Aerospace Engineering.
P. M. Moretti, and D. K. McLaughlin.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-256 709, $5.50 in paper copy, $3.00 in microfiche. Oklahoma Water Resources Research Institute, Stillwater, Completion Report (ER 76-ME-2), (1976). 98 p, 22 fig, 3 tab, 23 ref, 8 append. OWRT A-064-OKLA (1).

Descriptors: *Destratification, Lakes, *Hydraulic models, *Mixing, *Design criteria, Model studies, Jets, Density stratification, *Stratification, Oklahoma.
Identifiers: *Mechanical mixing, Ham's Lake(Okla).

The investigation was undertaken to analyze the effectiveness of devices for artificially destratifying lakes. A criterion for the effectiveness of mixing was selected. This criterion was applied to a number of variations of mechanical mixing devices, to indicate trends in optimization of designs. Experiments were performed in a vertically exaggerated scale model of Ham's Lake. Destratification was accomplished by a jet of water from two different sizes of propellers in different configurations (shrouded, skirted, and free; at two depths; and with a deflector) mixing the top water with the bottom water. Data taken from the experiments include density profiles as a function of time. The data were analysed determining the change of the stability index with time.
W76-11495

SCOUR AND FILL PATTERNS IN POOL-RAPID RIVERS,
Arizona Univ., Tucson. Dept. of Civil Engineering and Engineering Mechanics.
For primary bibliographic entry see Field 2J.
W76-11511

LIBRARY U. OF I. URBANA-CHAMPAIGN

8C. Hydraulic Machinery

INTERNATIONAL ASSOCIATION OF DRILLING CONTRACTORS DRILLING MANUAL,
International Association of Drilling Contractors, Houston, Tex. Rotary Drilling Committee.
International Association of Drilling Contractors, Ninth edition, 320 p., June, 1974.

Descriptors: *Drilling equipment, *Drilling, *Boreholes, *Wells, *Boring, *Rotary drilling, Core drilling, Borehole geophysics, Casing, Drilling fluids, Cement grouting, Training.
Identifiers: Drilling procedures, Drilling equipment specifications, Drilling equipment handling, Drilling equipment maintenance.

A manual of drilling equipment contains drilling system component specifications, recommended care, maintenance, and handling procedures. Detailed examples are given at the end of most chapters. A glossary of drilling terms contains the nomenclature of equipment and procedures. Some of the equipment listed are: bits, tool joints, drill pipe, casing, tubing, drill collars, kelly bars, pipe handling equipment, brakes, chains and sprockets, rotary hose, swivels, pumps, blow out prevention equipment, derricks and masts. Trouble shooting methods in the areas of hole deviation and stuck drill pipe are also explained. (Heiss-NWWA)
W76-11102

COST OPTIMIZATION OF RURAL WATER SYSTEMS,
Iowa State Univ., Ames. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6C.
W76-11167

METROPOLITAN TORONTO'S APPROACH TO PREVENTATIVE MAINTENANCE FOR TREATMENT PLANTS,
Metropolitan Toronto Dept. of Works, (Ontario). Water and Pollution Control Directorate.
For primary bibliographic entry see Field 5F.
W76-11255

8D. Soil Mechanics

GROYNE STABILIZATION OF SLOPE MOVEMENTS AND TOE EROSION, LAKE HURON NEAR BAYFIELD, ONTARIO,
University of Western Ontario, London. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W76-11290

8F. Concrete

INTERNATIONAL ASSOCIATION OF DRILLING CONTRACTORS DRILLING MANUAL,
International Association of Drilling Contractors, Houston, Tex. Rotary Drilling Committee.
For primary bibliographic entry see Field 8C.
W76-11102

USING PAPER MILL SLUDGE AS CONCRETE ADMIXTURE,
Michigan Technological Univ. Houghton.
For primary bibliographic entry see Field 5E.
W76-11399

8G. Materials

INTERNATIONAL ASSOCIATION OF DRILLING CONTRACTORS DRILLING MANUAL,
International Association of Drilling Contractors, Houston, Tex. Rotary Drilling Committee
For primary bibliographic entry see Field 8C.
W76-11102

SMOKE TEST SEWERS TO FERRET OUT ILLEGAL INFLOW,
W. S. Foster.
American City and County, Vol. 91, No. 6, p 44, June, 1976.

Descriptors: *Sewers, *Surface waters, *Smoke, *Inflow, Analytical techniques, *Infiltration, Pipelines, Measurement, Manholes, Tests, Testing procedures.
Identifiers: Smoke tests.

The use of smoke tests to identify pathways for the infiltration and inflow of unwanted surface water into public sewer systems is discussed. Smoke tests can be performed on a single line of sewers connected by two manholes or two lines connected by three manholes if the total run is not excessive. In the former case, the smoke is injected through either manhole; in the latter case, it is introduced through the center manhole. In either case the line or lines must be blocked to confine the smoke. The smoke can be produced either by candles or bombs that generate zinc chloride mist or by dioctylphthalate aerosol. A small portable blower like the type many municipal maintenance crews customarily use is sufficient for introducing the smoke into the manhole. If smoke rises from downspouts or outside drain, this indicates illegal connections with the sewerage system. Smoke appearing at the ground surface indicates a break in the pipeline. (Kreager-FIRL)
W76-11211

REVIEW OF STANDARDS AND OTHER INFORMATION ON THERMOPLASTIC PIPING IN RESIDENTIAL PLUMBING,
National Bureau of Standards. Washington, D. C.
R. S. Wyly, W. J. Parker, D. E. Rorrer, J. R. Shaver, and G. C. Sherlin.
Available from the National Technical Information Service, Springfield, Va 22161, as COM-75-10769, $4.50 in paper copy, $3.00 in microfiche. Building Science Series No. 68, May, 1975. 65 p, 1 fig, 10 tab, 56 ref, append.

Descriptors: *Plastic pipes, *Drains, *Plumbing, *Water conveyance, *Plastics, Performance, Burning, Heat resistance, Thermal properties, *Reviews.

Existing information on the physical characteristics of thermoplastic piping of particular interest for its use in residential, above-ground plumbing are reviewed. Adequacy of functional performance of plumbing systems is considered from the user's viewpoint. Thin-wall poly(vinyl chloride) (PVC) drain-waste-vent systems and tube-size chlorinated poly(vinyl chloride) (CPVC) water-distribution piping in particular were studied. Acrylonitrile-butadiene-styrene (ABS) is also widely used for water distribution and drain, waste, and vent systems (DWV). The principal issues involving thermoplastics piping for above-ground plumbing include potential fire hazards, effects of hot water, potential for chemically induced cracking, effects of hydrostatic pressure and water hammer, adequacy of acoustical performance, and ability to assure critical design and installation details through routine inspection. Where thermoplastics piping is approved, there are often restrictions, including type of waste, fire rating of the building, pipe wall thickness, and height. Performance of ABS and PVC drain-waste-vent piping apparently depends to a significant degree on installation and design details. (Snyder FIRL)
W76-11603

10. SCIENTIFIC AND TECHNICAL INFORMATION

10C. Secondary Publication And Distribution

COLLECTED REPRINTS, VOLUME III: 1971-1974,
Hawaii Univ., Honolulu. Water Resources Research Center
For primary bibliographic entry see Field 06B
W76-11103

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Bacterial Populations in Skadar Lake, (In Serbo-Croatian),
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CENTERS OF COMPETENCE AND THEIR SUBJECT COVERAGE

- Ground and surface water hydrology at the Illinois State Water Survey.

- Metropolitan water resources planning and management at the Center for Urban and Regional Studies of University of North Carolina.

- Eastern United States water law at the College of Law of the University of Florida.

- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.

- Water resources economics at the Water Resources Center of the University of Wisconsin.

- Eutrophication at the Water Resources Center of the University of Wisconsin.

- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.

- Water well construction technology at the National Water Well Association.

- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.

- Water resource aspects of the pulp and paper industry at the Institute of Paper Chemistry.

Supported by the Environmental Protection Agency in cooperation with WRSIC

- Effect on water quality of irrigation return flows at the Department of Agricultural Engineering of Colorado State University.

- Agricultural livestock waste at East Central State College, Oklahoma.

- Municipal wastewater treatment technology at the Franklin Institute Research Laboratories.

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A Semimonthly Publication of the Water Resources Scientific Information Center, Office of Water Research and Technology, U.S. Department of the Interior

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VOLUME 9, NUMBER 22
NOVEMBER 15, 1976

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tary of the U.S. Department of the Interior has de-
hat the publication of this periodical is necessary in the
n of the public business required by law of this Depart-
ment. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

FOREWORD

lected Water Resources Abstracts, a semimonthly ournal, includes abstracts of current and earlier pertinent ographs, journal articles, reports, and other publication ats. The contents of these documents cover the water-ed aspects of the life, physical, and social sciences as as related engineering and legal aspects of the charac-ics, conservation, control, use, or management of water. abstract includes a full bibliographical citation and a set scriptors or identifiers which are listed in the **Water urces Thesaurus.** Each abstract entry is classified into elds and 60 groups similar to the water resources re-h categories established by the Committee on Water urces Research of the Federal Council for Science and nology.

IC IS NOT PRESENTLY IN A POSITION TO PROVIDE ES OF DOCUMENTS ABSTRACTED IN THIS JOUR-Sufficient bibliographic information is given to enable rs to order the desired documents from local libraries er sources.

ted Water Resources Abstracts is designed to serve ientific and technical information needs of scientists, eers, and managers as one of several planned services Water Resources Scientific Information Center IC). The Center was established by the Secretary of the r and has been designated by the Federal Council for ce and Technology to serve the water resources com-by improving the communication of water-related ch results. The Center is pursuing this objective by co-ting and supplementing the existing scientific and tech-nformation activities associated with active research vestigation program in water resources.

vide WRSIC with input, selected organizations with water resources research programs are supported as rs of competence" responsible for selecting, abstract-ing, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on the inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the Bio-Science Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
U.S. Department of the Interior
Washington, DC 20240

U. S. DEPARTMENT OF AGRICULTURE

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ical Survey, Denver, Colo.
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T OF ATMOSPHERIC STABILITY ON R TEMPERATURE PREDICTIONS FOR RMALLY LOADED STREAM,
vania State Univ., University Park. School st.
nary bibliographic entry see Field 5B.
590

YPSOMETRIC INTEGRAL AND LOW MFLOW IN TWO PENNSYLVANIA NCES,
n Coll., N. Y. Dept. of Geology.
wall.
esources Research, Vol. 12, No. 3, p 497-e 1976. 5 fig, 4 tab, 30 ref.

ors: *Hypsometric analysis, flow, *Flow rates, *Pennsylvania, chian Mountain region, Low flow, Base Shales, Recession curves, Hydrology, eds(Basins), Lithologic logs, Summer, nes.
rs: *Hypsometric integral, Siltstones, n basins, Plateau basins.

streamflow duration and base flow reces-ves for eight watersheds draining sand-tstone-shale terranes in the Appalachian and Folded Appalachian Mountains of vania reflect variations in areal distribu- state of structural deformation of shal-hologic units. The hypsometric integral been used as a rapid reconnaissance e to evaluate hydrology characteristics ıantify the effects of lithology and struc-ormation on low streamflow. The HI pro-easure of the areal extent of sandstone in tershed, and the magnitude of summer w (sq ft/s/sq mi) increases as the value of al increased, to indicate a higher percent one. Streamflow duration data from the inces showed that siltstone-shale areas in tain province can produce as much low w per unit area as sandstone areas in the rovince. Short-term, summer studies of mflow characteristics are good measures rm, low streamflow characteristics. Thus sible to evaluate water resources with urveys at reduced expenses. (Roberts -
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TIC AND THE ANTARCTIC.
ry bibliographic entry see Field 2C.
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TIONAL FIELD YEAR FOR THE AKES.
ry bibliographic entry see Field 2H.
7

OW INTER-ARRIVAL TIMES,
iv. (England). Dept. of Geography.
erson.
Hydrology, Vol. 30, No. 1/2, p 105-112, 3 fig, 2 tab, 8 ref.

rs: *Hydrology, *Streamflow, *Peak *Stochastic processes, *Simulation analysis, *Flow characteristics, *Model studies, Flood routing, On-site investigations, Inflow.
Identifiers: *Erlang distribution, *Inter-arrival time, *Snowy Mountains Region(Australia), Sinuosity.

The use of Erlang distribution for modelling inter-arrival times between flow peaks was proposed. Application to empirical data revealed that distributions so modelled change downstream, and that such modification can be accounted for by channel sinuosity and inflow. (Terstriep - ISWS)
W76-11859

A POINT ENERGY AND MASS BALANCE MODEL OF A SNOW COVER,
National Weather Service, Silver Spring, Md. Office of Hydrology.
For primary bibliographic entry see Field 2C.
W76-11864

TURBULENT ENTRAINMENT AT THE DENSITY INTERFACE OF A TWO-LAYER STABLY STRATIFIED FLUID SYSTEM,
Johns Hopkins Univ., Baltimore, Md., Dept. of Earth and Planetary Science.
For primary bibliographic entry see Field 2L.
W76-11871

HYDROMETEOROLOGY OF HEAVY RAINSTORMS IN CHICAGO AND NORTHEASTERN ILLINOIS, PHASE I - HISTORICAL STUDIES,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 2B.
W76-11875

A MODEL OF PATCHINESS FOR PREY-PREDATOR PLANKTON POPULATIONS,
Liege Univ. (Belgium) Institut of Mathematique.
For primary bibliographic entry see Field 5C.
W76-11878

2B. Precipitation

EFFECT OF ATMOSPHERIC STABILITY ON WATER TEMPERATURE PREDICTIONS FOR A THERMALLY LOADED STREAM,
Pennsylvania State Univ., University Park. School of Forest.
For primary bibliographic entry see Field 5B.
W76-11690

A HYPOTHESIS FOR URBAN RAINFALL ANOMALIES,
Illinois State Water Survey, Urbana.
S. A. Changnon, Jr., R. G. Semonin, and F. A. Huff.
Journal of Applied Meteorology, Vol. 15, No. 6, p 544-560, June 1976. 22 fig, 41 ref. NSF AEN73-07796, ERDA AT(11-1)-1199.

Descriptors: *Rainfall, *Rainfall disposition, *Cities, *Missouri, Precipitation(Atmospheric), Rainfall intensity, Excessive precipitation, Urbanization, Industries, Air pollution, Weather modification, Storms, Rain, Meteorology.
Identifiers: *METROMEX, *St. Louis(Mo), Urban effects.

METROMEX was the first major field program aimed at studying the reality and causes of urban rainfall anomalies suggested in several climatological studies. The results from the 1971-74 METROMEX data portray statistically significant increases in summer rainfall, heavy (greater than 2.5 cm) rainstorms, thunderstorms and hail in and just east (downstorm) of St. Louis. Examination of the rainfall yield of individual showers (cells), the spatial distribution of echo (rain) developments, and areal distribution of afternoon rain clearly point to the urban-industrial complex as the site for the favored initiation of the rain process under certain conditions. The greater frequency of rain initiations over the urban and industrial areas appear to be tied to three urban-related factors including thermodynamic effects leading to more clouds and greater incloud instability, mechanical and thermodynamic effects that produce confluence zones where clouds initiate, and enhancement of the coalescence process due to giant nuclei. Case studies reveal that once additional cells are produced, nature, coupled with the increased likelihood for merger with more storms per unit area, takes over and produces heavier rainfalls. Hence, the city is a focal point for both rain initiation and rain enhancement under conditions when rain is likely. (Sims - ISWS)
W76-11744

THE DEGREE OF COMMON ORIENTATION OF HYDROMETEORS OBSERVED BY POLARIZATION DIVERSITY RADARS,
National Research Council of Canada, Ottawa (Ontario).
A. Hendry, G. C. McCormick, and B. L. Barge.
Journal of Applied Meteorology, Vol. 15, No. 6, p 633-640, June 1976. 6 fig, 3 tab, 15 ref, 1 append.

Descriptors: *Precipitation(Atmospheric), *Radar, *Rain, *Hail, Instrumentation, Investigations, Raindrops, Ice, Remote sensing, Electrical engineering, Meteorology.
Identifiers: *Hydrometeors, *Orientation of hydrometeors, Precipitation particles.

Measurements were presented of the extent to which a common alignment of hydrometeors exists in various forms of precipitation. The observations, obtained with circularly-polarized radars situated at Penhold, Alberta, and Ottawa, Ontario, were made at wavelengths of 10.4 and 1.82 cm respectively. Good agreement between results obtained at these two wavelengths was found for observations made on similar classes of precipitation. The degree of preferred alignment was high (typically 75%) in moderate or heavy rain; the presence of ice-phase hydrometeors was usually associated with a low degree of orientation. The degree of orientation, in conjunction with other parameters, was useful for the identification of the precipitation particles. Limitations on its usefulness imposed by propagation effects and by multiple scattering were discussed briefly. (Sims - ISWS)
W76-11745

PRACTICAL APPLICATIONS OF SPACE SYSTEMS.
National Research Council, Washington, D. C. Space Applications Board.
For primary bibliographic entry see Field 4A.
W76-11756

OBSERVATIONS IN HAILSTORMS USING THE T-28 AIRCRAFT SYSTEM,
South Dakota School of Mines and Technology, Rapid City. Inst. of Atmospheric Sciences.
W. R. Sand.
Journal of Applied Meteorology, Vol. 15, No. 6, p 641-650, June 1976. 5 fig, 1 tab, 33 ref. NSF C-460, NCAR 182-71.

Descriptors: *Thunderstorms, *Aircraft, *Radar, Hail, Precipitation(Atmospheric), Rainfall, Lightning, Turbulence, Storms, Particle size, Cloud physics, Meteorology.
Identifiers: *Hailstorms, Liquid water content, Updrafts, Aircraft icing.

This study related data gathered during the penetration of hailstorms between 4.9 and 6.7 km MSL by an armored T-28 aircraft to detailed radar data of the hailstorms penetrated. These data recorded by the T-28 data system were combined

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with observations made by the author while piloting the T-28 through hailstorms. The radar data from the National Hail Research Experiment CPR-2 were specially prepared as Constant Altitude Plan Position Indicator (CAPPI) displays and vertical sections along the aircraft track for comparison with the data gathered by the aircraft system and pilot's observations. The results indicated that significant updrafts are frequently found well ahead of the high radar reflectivity zones. The updrafts were found to be relatively smooth while the high radar reflectivity zones were found to be very turbulent. Significant quantities of supercooled liquid water were found in the updraft regions. Significant airframe icing was found in the strong updrafts with the most severe icing along the edges of the updrafts. The high reflectivity zones were found to contain almost exclusively ice. Hail was more frequently found in the area of strong reflectivity, but small hail was found outside the 40 dBZ contour. (Sims - ISWS)
W76-11851

A COMPARISON OF PHOSPHORUS AND WATER CONTRIBUTIONS BY SNOWFALL AND RAIN IN NORTHEAST OHIO,
Kent State Univ., Ohio. Dept. of Geology.
For primary bibliographic entry see Field 5B.
W76-11858

ANALYSIS OF HYDROLOGIC RESPONSE TO RAIN-ON-SNOW,
Cold Regions Research and Engineering Lab., Hanover, N. H.
For primary bibliographic entry see Field 2C.
W76-11866

PROJECT SKYWATER, A PROGRAM OF RESEARCH IN PRECIPITATION MANAGEMENT, VOLUME I OF II (DRAFT ENVIRONMENTAL STATEMENT).
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
For primary bibliographic entry see Field 3B.
W76-11868

PROJECT SKYWATER, A PROGRAM OF RESEARCH IN PRECIPITATION MANAGEMENT, VOLUME II OF II (DRAFT ENVIRONMENTAL STATEMENT).
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
For primary bibliographic entry see Field 3B.
W76-11869

HYDROMETEOROLOGY OF HEAVY RAINSTORMS IN CHICAGO AND NORTHEASTERN ILLINOIS, PHASE I - HISTORICAL STUDIES,
Illinois State Water Survey, Urbana.
F. A. Huff, and J. L. Vogel.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-257 062, $4.50 in paper copy, $3.00 in microfiche. ISWS Report of Investigation 82, 1976. 63 p, 22 fig, 18 tab, 30 ref. NSF ENV76-01447.

Descriptors: *Rainfall, *Excessive precipitation, *Cities, *Illinois, Precipitation(Atmospheric), Rainfall disposition, Rainfall intensity, Hydrology, Urban hydrology, Climatology, Meteorology, Storms, Floods, Storm water, Storm runoff, Weather, Depth-area curves, Depth-area-duration analysis, Structures, Hydraulic structures.
Identifiers: *Northeastern Illinois, *Chicago(Ill).

This report presents the results of an investigation of heavy rainstorms in the Chicago urban area and the surrounding six counties, based on available historical data of rainfall and associated weather conditions. The counties are Cook, Du Page, Kane, Will, Lake, and McHenry. Frequency distributions of point rainfall are presented for rain periods from 5 minutes to 72 hours and recurrence intervals of 6 months to 50 years. Also presented are the relationship between point and areal mean rainfall frequencies, time and space distribution characteristics of heavy rains, orientation and movement of storms, the frequency distribution of storm centers, synoptic weather conditions associated with severe rainstorms, and the diurnal, monthly, and seasonal distribution of flood-producing storms. Results of this investigation are particularly useful in hydrologic design problems, such as in the design of urban storm sewer systems, but have application also in agriculture, environmental problems, and various phases of climatology and hydrometeorology. This historical study is the first phase of a comprehensive hydrometeorological research program for northeastern Illinois. The second phase will involve an extensive field and analysis program utilizing a large rain-gage network, weather radars, and other meteorological equipment to acquire the hydrometeorological knowledge needed to optimize the design and operation of sophisticated water resources systems. (Sims-ISWS)
W76-11875

2C. Snow, Ice, and Frost

INVESTIGATION AND CALCULATIONS OF ICE JAMS,
A. N. Chizhov.
Available from the National Technical Information Service, Springfield, Va 22161, as ADA-014 887, $5.50 in paper copy, $3.00 in microfiche. Cold Regions Research and Engineering Laboratory Draft Translation 473, March 1975. 106 p, 23 fig, 16 tab, 52 ref. Translated from Trudy Gosudarstvennogo Gidrologicheskogo Instituta, No. 219, 1974. 88 p.

Descriptors: *Ice jams, *Rivers, *Cold regions, Ice, Ice cover, Model studies, Ice loads, Powerplants, Electric powerplants, Hydroelectric powerplants, Dams, Tailwater, Remote sensing, Aerial photography, Hydrology.
Identifiers: *USSR.

This collection of six papers is concerned with the questions of ice jam phenomena on rivers. The articles indicate the quantitative tendencies in the formation of ice jams on the Dnestr River based on materials obtained from observations of past years, full-scale and model investigations, the results from studying the tendencies in ice jam phenomena in the tailwaters of hydroelectric power plants; plus a procedure for calculating these occurrences. The authors also expound on the experience gained in modeling the movement of slush ice beneath an ice cover and the results obtained from aerial photographing of jams occurring on rivers. (Sims-ISWS)
W76-11749

PRESSURES OF THERMAL ORIGIN EXERTED BY ICE SHEETS UPON HYDRAULIC STRUCTURES,
Laval Univ., Quebec. Lab. of Ice Mechanics.
M. Drouin, and B. Michel.
Available from the National Technical Information Service, Springfield, Va 22161, as ADA-014 938, $11.75 in paper copy, $3.00 in microfiche. Cold Regions Research and Engineering Laboratory Draft Translation 427, October 1974. 405 p, 186 fig, 21 plate, 37 tab, 112 ref, 4 append. Translated from Laval University Mechanics of Ice Laboratory Report S-23.

Descriptors: *Ice, *Thermal properties, *Hydraulic structures, Iced lakes, Structures, Laboratory tests, Model studies, Temperature, Physical properties, Ice loads, Lake ice, Rheology, Stress, Strain, Strain measurement, Snowpacks, Mechanical properties.
Identifiers: *Ice sheets.

Ice expands or contracts as a function of temperature variation. Partial or total restriction of the expansion of a sheet of ice gives rise to conditions of stress which the engineer must consider in analyzing the stability of hydraulic structures. Each has its own particular characteristics the principle ones are the following: meteorological conditions texture and structure of the ice, topography of banks, thickness of the ice, thickness and density of the snow covering the ice, and cracks in the ice sheet. The objective of this research was to study pressures of thermal origin exerted by an ice sheet as a function of these parameters. This study began with a bibliographic compendium of the principle theories elaborated from 1922 to 1968. The analysis and discussion of these investigations showed the complexity of the problem and the importance of determining at the start the rheological characteristics of the principle types of ice. The paper discussed, in order, thermal properties of ice, heat transfer through ice sheets, types of rise in air temperatures in the Quebec region, and rheological behavior of snow-pack ice and columnar ice deformed in simple compression. The results of these studies were used in calculations of pressures of thermal origin exerted by ice sheets restrained in one direction. Finally a discussion of the effects of biaxial conditions of restraint, of the presence of snow upon the ice, and of cracks in an ice sheet was presented. (Sims-ISWS)
W76-11750

MEASUREMENT OF LAKE ICE THICKNESS WITH A SHORT-PULSE RADAR SYSTEM,
National Aeronautics and Space Administration, Cleveland, Ohio. Lewis Research Center.
For primary bibliographic entry see Field 7B.
W76-11753

PRACTICAL APPLICATIONS OF SPACE SYSTEMS, SUPPORTING PAPER 5, INLAND WATER RESOURCES.
National Research Council, Washington, D. Panel on Inland Water Resources.
For primary bibliographic entry see Field 4A.
W76-11758

THE COLVILLE RIVER AND THE BEAUFORT SEA: SOME INTERACTIONS,
Louisiana State Univ., Baton Rouge. Dept. Geography and Anthropology.
For primary bibliographic entry see Field 2L.
W76-11767

THE ARCTIC AND THE ANTARCTIC.
Available from the National Technical Information Service, Springfield, Va 22161, as AD-A 888, $4.50 in paper copy, $3.00 in microfiche. Cold Regions Research and Engineering Laboratory Draft Translation 474, August 1975. 70 p, 12 fig, tab. Translated from Mezhduvedomstvennyi Komitet SSSR po mezhdunarodnoi gidrologichesk omu desiatiletiiu, Leningrad, Gidrometeoizdat, p 422-475, 1974.

Descriptors: *Arctic, *Antarctic, *Cold regions, Glaciers, Ice, *Water balance, Water resources, Precipitation(Atmospheric), Snowfall, Evaporation, Runoff.
Identifiers: *Greenland, *Antarctica.

This excerpt from a book on world water balance describes the arctic and antarctic water supply specifically. It describes in great detail the extent of glacier runoff, geographical and topographic characteristics, and the climatological influences on water balance in these areas. (Sims - ISWS)
W76-11768

RIVERBANK FORMS OF THE COLVILLE RIVER DELTA,
Aberdeen Univ., (Scotland). Dept. of Geography.
For primary bibliographic entry see Field 2L.
W76-11769

GN FACTORS FOR RIVER ICE BOOMS
LYZED,
Latyshenkov.
able from the National Technical Informa-
Service, Springfield, Va 22161, as AD-A014
3.50 in paper copy, $3.00 in microfiche. Cold
ns Research and Engineering Laboratory
Translation 485, September 1975. 13 p, 10
Translated from Gidrotekhnicheskoe
el'stvo, Vol. 15, No. 4, p 13-19, 1946.

iptors: *Ice, *Rivers, *Structures, Ice cover,
Ice loads, Loads(Forces), Streamflow, Bar-
Cold regions, Mechanical engineering,
ulics.
fiers: *Ice booms, Ship protection, Ice pres-

studies were made to determine hydraulic
teristics of structures for protecting ships
ing in rivers under conditions similar to
observed in European and Siberian rivers
ver thickness up to 1.8 m and river depth to
The experiments were described in detail,
ta were mathematically analyzed. Formulas
aphs for calculating the stresses as a func-
ice-cover thickness, flow speed, and width
epth of the river were suggested. The ice
re on protective booms in a stream wider
m was found to increase 85-90% due to the
between the lower ice surface and flowing
The friction coefficient is proportional to
io of ice thickness to flow depth. (Sims -

772

VATIONS IN HAILSTORMS USING THE
IRCRAFT SYSTEM,
Dakota School of Mines and Technology,
City. Inst. of Atmospheric Sciences.
nary bibliographic entry see Field 2B.
851

ENING OF THE ROSS ICE SHELF AND
IBRIUM STATE OF THE WEST AN-
IC ICE SHEET,
ka Univ., Lincoln. Ross Ice Shelf Project.
nomas.
Vol. 259, No. 5540, p 180-183, January 22,
ig, 29 ref.

tors: *Ice, *Antarctic, *Glaciers, Strain,
measurement, Movement, Sheet flow,
n, Data processing, Analytical techniques,
investigations, Coasts, Continental shelf,
ions.
rs: *Ice sheets, *Ice shelves, *Ross Ice
ntarctica), Ice accumulation.

m the south-east quadrant of the Ross Ice
ntarctica, indicate that near the grounding
ice shelf is growing thicker by almost 1
is thickening rate implies an advance of 1
the grounding line between the West An-
e sheet and the Ross Ice Shelf. It can be
d with independent evidence for current
of the West Antarctic ice sheet if the
delayed response to an earlier retreat of
helf grounding line. The high rates of ice
kening may be due to an increase in the
e to ice shelf movement caused by local-
shelf grounding following isostatic uplift
bed. (Sims - ISWS)
52

PARISON OF PHOSPHORUS AND
CONTRIBUTIONS BY SNOWFALL
N IN NORTHEAST OHIO,
e Univ., Ohio. Dept. of Geology.
ry bibliographic entry see Field 5B.
58

A POINT ENERGY AND MASS BALANCE MODEL OF A SNOW COVER,
National Weather Service, Silver Spring, Md. Office of Hydrology.
E. A. Anderson.
For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402. National Oceanic and Atmospheric Administration Technical Report NWS 19, February 1976. 150 p, 32 fig, 13 tab, 85 ref, 1 append.

Descriptors: *Snow cover, *Model studies, *Energy transfer, Radiation, Snowmelt, Temperature, Energy budget, Heat transfer, Mathematical models, Computer models, Snow, Ice, Water resources, Energy, Melting, Hydrology, Equations.
Identifiers: *Mass balance, *Energy exchange, Finite-difference equations, Newton-Raphson iteration technique.

A point energy and mass balance model was developed for a snow cover. The model was based on two equations. These were the snow cover energy balance equation and the equation for energy transfer within a snow cover. The snow cover was divided into finite layers. Implicit finite-difference expressions, based on the two equations, were written for each layer. This set of non-linear finite-difference equations was solved by use of the Newton-Raphson iteration technique. The model also included mathematical representations of the densification of the snow and the retention and transmission of liquid-water. The model was tested on an extensive, high-quality set of data obtained as part of a cooperative snow research project between NOAA and the Agricultural Research Service near Danville, Vermont. Six years of data were used. The comparison of observed and computed values of snow cover outflow, water-equivalent, temperature, and density, plus snow surface temperature and density was quite good. The results obtained with this energy balance model were compared to results obtained with a temperature index snow cover model. The energy balance model gave improved results. These comparisons and the energy exchange theory suggest that an energy balance model should give improved results in open areas and under extreme conditions when adequate data are available. Index snow cover models should give completely adequate results in heavily forested areas. (Sims-ISWS)
W76-11864

AN ANALYSIS OF WATER FLOW IN DRY SNOW,
Cold Regions Research and Engineering Lab., Hanover, N. H.
S. C. Colbeck.
Water Resources Research, Vol. 12, No. 3, p 523-527, June 1976. 3 fig, 1 tab, 12 ref. Army 4A161102B52E.

Descriptors: *Water supply, *Snow, Water, Advection, Water measurement, Runoff, Wetting, Temperature, Adsorption, Flow rates, Thermodynamic behavior, Flow, Grain size, Time lag, Discharge(Water), Equations.
Identifiers: *Dry snow, Ripe snow, Ice grains, Wetting front, Freeze-thaw-metamorphism.

Equations describing water movement in a dry snow cover were derived, and examples of flow through ripe, refrozen, and fresh snows were given. As the leading edge of a wave of liquid water advanced into subfreezing snow, the liquid water was the principal source of the thermal energy needed to raise the snow to its melting temperature, because advection of water is generally faster than heat conduction. There are three requirements which have to be met before the wetting front can propagate past any level. First, a volume of water per unit volume of snow has to be frozen onto the snow grains in order to supply enough latent heat to raise the snow to O C. Second, a volume of water per unit volume of snow has to be supplied to fill the residual water requirement, retained as an adsorbed film, and the water held immobile in the menisci between the snow grains. Third, any additional water supplied is mobile, and in principle the wetting front propagates downward at a rate determined by the rate at which water can be supplied to raise the liquid saturation to the level which corresponds to the value of water flux just above the wetting front. These requirements delay and reduce runoff following rain on dry snow. (See also W76-11866) (Roberts-ISWS)
W76-11865

ANALYSIS OF HYDROLOGIC RESPONSE TO RAIN-ON-SNOW,
Cold Regions Research and Engineering Lab., Hanover, N. H.
S. C. Colbeck.
Available from the National Technical Information Service, Springfield, Va 22161, as AD-A013 383, $3.50 in paper copy, $3.00 in microfiche. Research Report 340, July 1975. 13 p, 5 fig, 1 tab, 11 ref, 1 append.

Descriptors: *Rainfall, *Snow, *Runoff, Snow cover, Precipitation(Atmospheric), Hydrology, Hydrologic aspects, Runoff forecasting, Snowmelt, Ice.

The equations describing water movement in a dry snow cover were derived and examples of flow through ripe, refrozen and fresh snows were given. The grain size of snow has a large effect on the timing of water discharge. Water is retained by dry snow to raise its temperature and satisfy the irreducible water saturation. These requirements delay and reduce runoff following rain on dry snow. (See also W76-11865) (Sims-ISWS)
W76-11866

CHARACTERISTICS OF THE FORECAST OF THE DATES OF ICE APPEARANCE IN THE LENA RIVER, OF THEIR PROBABILITY DISTRIBUTION, AND OF THE FREEZE-UP REGIME,
K. N. Polyakova.
Soviet Hydrology, Selected Papers, No. 6, p 371-377, 1974. 3 fig, 3 tab, 5 ref. Translated from Transactions of the Hydrometeorological Center of the USSR (Trudy GMRs), No. 117, p 64-73, 1974.

Descriptors: *Ice, *Rivers, *Forecasting, Model studies, Heat transfer, Freezing, Permafrost, Cold regions, Air temperature, Water temperature, Energy dissipation, Energy loss, Streamflow, Meteorology, Probability, Distribution.
Identifiers: *USSR, *Lena River(USSR).

Ice begins to form in the Lena, as in other rivers, when the water temperature nears 0 C. As a rule, grease ice appears first. If the water temperature reaches 0 C and supercools further, underwater ice crystals accumulate in windy weather or in reaches with a faster current and form so-called slush. A detailed analysis was performed for Kachug, Zhigalovo, Kirensk, Vitim, Olekminsk, Yakutsk, Zhugansk, and Kyusyur. For the date of appearance of floating ice, the date was taken of the steady appearance of slush, ice or slush run, and for the beginning of the freeze-up, the beginning date of the formation of a motionless ice cover. As a result of their unusual combinations, freeze-up occurs earliest in the lower course of the river in the Zhigansk-Kyusyur reach and in its upper course, in the Markovo-Kirensk reach. In both these reaches the average freeze-up dates are in late October. Downstream of Kirensk, in the Ichera-Peleduy reach, freeze-up is latest, on November 13-15 on the average. The rest of the river usually freezes up in the first 10 days of November. The duration of freeze-up formation along the river averages 28 days (October 18-November 15), i.e., it is twice as long as the propagation of initial ice formation. This is also the

U. S. DEPARTMENT OF COMMERCE

result of the great difference in the duration of the ice run in various reaches of the Lena. After the freeze-up, the ice thickness increases rapidly, as much as 15-20 cm over a 10-day period, until January. In January-February ice growth averages 5-10 cm and in March, 2-7 cm over a 10-day period. Maximum ice thickness in the Upper Lena is recorded in the last 10 days of March and in the Middle Lena from April 10 to 20. In the lower reach of the Lena, ice thickness continues to increase by 3-5 cm over a 10-day period until the first half of April. The ice reaches its maximum thickness at the end of April. (Sims - ISWS)
W76-11867

AIR BUBBLER SYSTEMS TO SUPPRESS ICE,
Cold Regions Research and Engineering Lab., Hanover, N.H.
G. D. Ashton.
Available from the National Technical Information Service, Springfield, Va 22161 as ADA-008 867, $4.00 in paper copy, $3.00 in microfiche. Special Report 210, September 1974. 35 p, 16 fig, 27 ref, 1 append. Army NCE-IA-73-108.

Descriptors: *Ice cover, *Ice breakup, *Bubbles, *Model studies, Bodies of water, Lakes, Rivers, Ice, Water temperature, Melting, Heat transfer, Circulation, Water circulation, Systems analysis.
Identifiers: *Air bubble systems, Ice prevention, Ice formation, Ice suppression.

Two-dimensional line source air bubbler systems used to induce convective melting of the undersurface of an ice cover over a water body were analyzed and a procedure was developed for predicting the effectiveness of the systems. Various field conditions were considered and limitations to the effectiveness of the systems were pointed out. Example applications of the concepts and the procedures were illustrated in the Appendix. (Sims-ISWS)
W76-11874

2D. Evaporation and Transpiration

FLOW FROM SMALL WATERSHEDS ADJACENT TO THE STUDY REACH OF THE GILA RIVER PHREATOPHYTE PROJECT, ARIZONA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 2E.
W76-11677

METHODS FOR COMPUTING THE EVAPORATION OF LAKE FERTOE, (IN GERMAN),
Orszagos Meteorologiai Intezet, Budapest (Hungary). Zentralanst. Atmos. Phys.
F. Kozma, and E. Toth.
Arch Meteorol Geophys Bioklimatol Ser B Klimatol Umweltmeteorol Strahlungsforsch. 23(1/2), p 99-110, 1975.

Descriptors: Evaporation, Lakes, Europe, Methodology, Evapotranspiration, Evaporation pans, Water balance, Climates.
Identifiers: *Reed, *Lake Fertoe(Hungary).

Hydrometeorological investigations were carried out since 1969 in the Hungarian part of Lake Ferro to determine the evaporation from the water surface and of the evapotranspiration of the regions covered by reed. The results obtained by the energenic formula of Hofmann, are compared with results obtained by applying other methods of computing evaporation. A description is given of the modified Hofmann formula, and of the results obtained with it. An analysis of the data obtained with evaporation pans relating these with some components of the water balance and with some climatic elements is given. --Copyright 1975, Biological Abstracts, Inc.
W76-11741

MODEL FOR PREDICTING EVAPOTRANSPIRATION FROM NATIVE RANGELANDS IN THE NORTHERN GREAT PLAINS.
Agricultural Research Service, Boise, Idaho. Northwest Watershed Research Center.
C. L. Hanson.
Transactions of the American Society of Agricultural Engineers, Vol. 19, No. 3, p 471-481, May-June 1976. 5 fig, 4 tab, 42 ref.

Descriptors: *Evapotranspiration, *Range grasses, *Vegetation, *Model studies, *Great plains, Water, Energy budget, Soil water, Ranges, Forecasting, Estimating, Mathematical models, On-site data collections.
Identifiers: *Northern Great Plains, *Growing season, Potential evapotranspiration, Model calibration.

A study was made to develop a model for estimating evapotranspiration from Northern Great Plains native rangeland, based on potential evapotranspiration, available soil water, leaf area, and direct evaporation from the soil and intercepted water from plants. To calibrate and test the model, data from Gillette, Wyoming, Cottonwood, South Dakota, and Sidney, Montana, were collected and evaluated. An optimization routine was employed to obtain the parameter values of the model. To estimate potential evapotranspiration, an approximate energy balance method and the United States Weather Bureau Class A pan evaporation were used because the data required by them were available or easily computed. The approximate energy balance method required daily solar radiation and mean daily air temperature. Based on model verification, the energy balance equation and the pan evaporation equation could be used to predict daily as well as mean 5-, 7-, and 10-day potential evapotranspiration. Model evaluation also indicated that it was better to use the approximate energy balance method than the Class A pan method for potential evapotranspiration. The model predicted daily as well as mean evapotranspiration better in loam soil areas than in fine clay soil areas. (Roberts - ISWS)
W76-11742

EVAPOTRANSPIRATION FROM A SHORTGRASS PRAIRIE SUBJECTED TO WATER AND NITROGEN TREATMENTS,
Colorado State Univ., Fort Collins. Natural Resource Ecology Lab.
W. K. Lauenroth, and P. L. Sims.
Water Resources Research, Vol. 12, No. 3, p 437-442, June 1976. 8 fig, 1 tab, 18 ref. U.S. International Biological Program Grassland Biome. NSF GB-7824, GB-13096.

Descriptors: *Evapotranspiration, *Prairie soils, *Grasses, *Colorado, *Great Plains, Water, Nitrogen, Water balance, Soil-water-plant relationships, Energy budget, On-site investigations, Soil treatment.
Identifiers: *Shortgrass prairie, Soil-water potential, Ascalon sandy loam soil, Penman's method, Green needlegrass.

Evapotranspiration was estimated by the water balance method for three water and nitrogen treatments and a control in a shortgrass prairie in northeastern Colorado in 1971, 1972, and 1973. Nitrogen was applied at a rate of 150 kg/ha to maintain soil mineral nitrogen levels greater than or equal to 50 kg/ha above control levels with and without supplemental water. The water treatment maintained soil water potential greater than -0.8 bar during the growing season and was applied with and without nitrogen. Evapotranspiration for the control and unwatered nitrogen treatments was not different and ranged from 118 to 226 mm over the 3 years. The 3-year averages of evapotranspiration for the water plus nitrogen treatments were 505 and 578 mm, respectively. Evapotranspiration for the water plus nitrogen treatment agreed with potential evapotranspiration predicted by Penman's model. (Roberts-ISWS)
W76-11849

A POINT ENERGY AND MASS BALAN MODEL OF A SNOW COVER,
National Weather Service, Silver Spring, Md fice of Hydrology
For primary bibliographic entry see Field 2C
W76-11864

2E. Streamflow and Runoff

SURFACE WATER SUPPLY OF THE UNI STATES, 1966-70: PART II. PACIFIC SL BASINS IN CALIFORNIA--VOLUME I. BA FROM TIJUANA RIVER TO SANTA MA RIVER,
Geological Survey, Reston, Va
For primary bibliographic entry see Field 7C
W76-11669

FLOOD HYDROLOGY OF BUTTE BASIN AND 1974 WATER YEARS, SACRAME VALLEY, CALIFORNIA--A PROGRESS PORT,
Geological Survey, Menlo Park, Calif.
R. G. Simpson.
Available from the National Technical Info tion Service, Springfield, Va 22161, as ADA 213, $4.50 in paper copy, $3.00 in microf Water-Resources Investigation 36-75, March 53 p, 18 fig, 4 tab, 8 ref, append

Descriptors: *Flood data, *Streamflow, * rates, *Peak discharge, *Storms, Flood pro Hydrologic data, Data collections, Gaging tions, Stream gages, Discharge(Water), stage gages.
Identifiers: *Butte Basin(Calif), *Sacramento ley(Calif).

Stage and discharge data are being collect selected locations to describe the flood hydr of Butte Basin. Flooding in the basin is c primarily by overflow from the Sacramento which forms the western boundary of the Overflow from the Sacramento River is mea along four roads which cross the basin-Ord Road, Afton Boulevard, State Highway 16 Gridley Road-- and at Moulton and Colusa During the 1973 water year only minor floodi curred near the roads, and flows were carr existing channels. Overflow at Colusa reached a peak flow of about 40,000 cfs on ry 20; overflow at this weir caused most flooding within the lower part of Butte Ba peak stage of 57.5 ft was recorded in Butte opposite Colusa Bypass. Two floods, one January and the second at the end of caused overflow to Butte Basin during th water year. Peak overflow along Ord Ferry was about 70,000 cfs on January 17 and was 38,000 cfs on March 31. About half the ov from these floods returned to the main chan fore reaching Afton Boulevard. Peak flows Afton Boulevard, State Highway 162, and Road, ranged from about 39,000 cfs to 44, on January 18 and from about 21,000 cfs to cfs on April 1. Peak overflows at Moulto were nearly 60,000 cfs during both floods stages in Butte Basin opposite Colusa Bypa 61.3 ft on January 19 and 60.3 ft on A (Woodard-USGS)
W76-11670

MAP SHOWING SELECTED EXT STREAMFLOW STATISTICS AND DRA AREAS, GREATER PITTSBURGH RE PENNSYLVANIA,
Geological Survey, Harrisburg, Pa.
For primary bibliographic entry see Field 7
W76-11671

MANUAL FOR ESTIMATING CHARACTERISTICS OF NATURAL STREAMS IN COLORADO,
Geological Survey, Denver, Colo.

. F. McCain, and R. D. Jarrett.
Colorado Water Conservation Board, Denver, Technical Manual No 1, 1976. 68 p, 12 fig, 8 tab, 33 ef.

Descriptors: *Flood forecasting, *Natural flow, Streams, *Colorado, *Flow characteristics, Methodology, Flood recurrence interval, Flood lains, Topography, Hydrologic data, Flood requency, Regression analysis, Rainfall-runoff elationships, *Estimating.

his manual contains methods for obtaining flood nformation for the 10-, 50-, 100-, and 500-year oods at sites on natural-flow streams in olorado. The peak-discharge information is ap-icable to a wide variety of studies ranging from pid approximation of flood-prone areas to etailed flood-plain studies based on precise ydraulic field measurements. Conversely, the ood-depth information is applicable only for pid approximation of flood-prone areas or as a neral guide to flood depths for comparative pur-ses. This limited usage of the flood-depth infor-ation results from the difficulty in evaluating eld conditions, such as channel width, and size of uctures, such as bridges and culverts, from ex-ng topographic maps. The methods are scribed and a step-by-step procedure for apply-g the methods is presented with several exam-es. Procedures for transferring the depth infor-ation to topographic maps are also described. her sections contain a discussion of accuracy, alytical development of the methods, and a list flood data for gaging stations. (Woodard-GS)
76-11672

OODS OF MAY-JULY 1975, ALONG THE NTINENTAL DIVIDE IN MONTANA,
ological Survey, Helena, Mont.
V. Johnson, and R. J. Omang.
en-file report 76-424, June 1976. 12 p, 2 fig, 1 , 3 ref.

scriptors: *Floods, *Flood data, *Streamflow, ak discharge, *Montana, Flow rates, Flood charge, Hydrologic data, Rainfall, Snowmelt, cky Mountain Region, Flood recurrence inter-Flood frequency.
ntifiers: *Continental Divide(Mont).

ensive flooding occurred along both sides of Continental Divide in Montana from May ugh July 1975. Runoff from above average wpack at low altitudes combined with runoff n rainfall to cause floods in May. Snowmelt n high altitudes and above average rain in June sed flooding and sustained high flows into July. eral and State agencies estimated flood age at about $53,000,000. Peak stages, flow s, and estimated frequencies were determined 124 sites. Small tributaries of the upper Clark k and Missouri River had peak-of-record flows any sites. The 1975 floods are hydrologically ificant because many of the flood peaks ap-imate the 100-year flood magnitude. odard-USGS)
-11675

W FROM SMALL WATERSHEDS AD-ENT TO THE STUDY REACH OF THE A RIVER PHREATOPHYTE PROJECT, ZONA,
ogical Survey, Menlo Park, Calif.
. Burkham.
lable from Supt. of Documents, GPO, Wash., 20402, Price $0.55. Professional Paper 655-I, 119 p, 8 fig, 2 plates, 3 tab, 16 ref.

riptors: *Storm runoff, *Streamflow, drologic budget, *Small watersheds, zona, Evapotranspiration, Phreatophytes, rologic data, Flow rates, Peak discharge.
ifiers: *Gila River tributaries(Ariz).

The Gila River in Safford Valley, southeastern Arizona, was the site for a field study of evapotranspiration (Culler and others, 1970). During the period of study, 1963-71, measurements of storm runoff in summer--July through October--from tributaries along a 15-mile reach of the Gila River were required for water budget analyses. Most of the outflow from the 43 tributary basins, which range in size from about 0.1 to 20 square miles resulted from thunderstorms of small areal extent. The mean summer runoff for 1963-71 was about 1,370 acre-ft. The maximum summer runoff was about 3,180 acre-ft in 1967 and the minimum was about 130 acre-ft in 1970. The largest storm outflow was about 970 acre-ft. The largest peak discharge occurring in a tributary stream was 8,000 cubic feet per second (cfs) which came from a 14 square mile watershed. The largest peak discharge per square mile was about 2,300 cfs which resulted from a storm centering on a 0.79 square mile watershed. The tributary watersheds contributed to the project area on an average of less than 13 days per year. (Woodard-USGS)
W76-11677

SOIL SLIPS, DEBRIS FLOWS, AND RAINSTORMS IN THE SANTA MONICA MOUNTAINS AND VICINITY, SOUTHERN CALIFORNIA,
Geological Survey, Reston, Va.
R. H. Campbell.
Available from Supt. of Documents, GPO, Wash., D. C. 20402, Price $1.70. Professional Paper 851, 1975. 51 p, 36 fig, 1 tab, 54 ref.

Descriptors: *Landslides, *Soils, *Storm runoff, *California, Reviews, Evaluation, Topography, Soil properties, Slopes, Hydrologic data, Rainfall, Storms, Aerial photography, Vegetation, Soil moisture, Debris avalanches, Damages.
Identifiers: *Soil slips(Southern Calif), *Santa Monca Mountains(Calif).

On the record of the past decade, debris flows generated by soil slips during rainstorms present a greater risk of death and injury to southern California residents than all other kinds of slope failure combined. Soil slips require a combination of three conditions: (1) A mantle of colluvial soil or a wedge of colluvial ravine fill, on (2) a steep slope, where (3) soil moisture is equal to or greater than the liquid limit of the remolded colluvial soil. The most common range of slope for soil slip that give rise to destructive debris flows is from about 56 degrees to about 27 degrees. Slopes steeper than 56 degrees generally do not have a continuous mantle of colluvium; most commonly they are bare bedrock. The lowest slope on which a soil slip has been reported in coastal California is 15 degrees. With radar weather maps showing the distribution of high-intensity rainfall and slope maps showing the distribution of slopes of the most susceptible steepness, the empirical association may provide a means of recognizing areas where the hazard is greatest at any given time during a storm, and warnings to residents could be more specific and reliable. (Woodard-USGS)
W76-11680

ON THE JOINT DISTRIBUTION OF THE LARGEST FLOOD AND ITS TIME OF OCCURRENCE,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
V. K. Gupta, L. Duckstein, and R. W. Peebles.
Water Resources Research, Vol. 12, No. 2, p 295-304, April 1976. 2 fig, 1 tab, 10 ref, 3 append. OWRT B-032-ARIZ(25). NSF GK-35915 and GK-35791.

Descriptors: *Flood frequency, *Annual peak discharge, *Flood peak, *Mississippi River, Stochastic processes, Hydrograph analysis, Streamflow, Hydrology, Frequency analysis, Time of concentration, Model studies, Kentucky, Minnesota, *Distribution patterns.
Identifiers: Partial duration series, Distribution function, Exceedance, *Licking River(Ky), *St. Paul(Minn).

In a partial duration series the total number of exceedances as well as the exceedance flows is formalized as a random sequence of random variables. This formalism along with some physically reasonable assumptions leads to a rigorous expression for the joint distribution function of the largest exceedance and its time of occurrence. The deviation provides one way to consider the temporal changes in the occurrence and the magnitudes of individual exceedances due to 'seasonal' influences. This approach is general enough to be applied to any time interval of interest; furthermore, the derived expressions are exact (nonasymptotic). It may thus represent an improvement over an application of Gumbel's classical extreme value theory to flood phenomena, which is based on the premise that a large number of exceedances are available over time intervals of interest and which provides only asymptotic expressions. (Lardner-ISWS)
W76-11694

THE HYPSOMETRIC INTEGRAL AND LOW STREAMFLOW IN TWO PENNSYLVANIA PROVINCES,
Brooklyn Coll., N. Y. Dept. of Geology.
For primary bibliographic entry see Field 2A.
W76-11743

A MODEL OF TURBULENT DIFFUSION,
Technische Hogeschool, Delft (Netherlands). Dept. of Civil Engineering; and Technische Hogeschool, Delft (Netherlands). Lab. of Fluid Mechanics.
C. Kranenburg.
Report No. 75-2, 1976. 43 p, 5 fig, 19 ref, 2 append.

Descriptors: *Turbulence, *Diffusion, *Hydraulics, *Model studies, *Analytical techniques, Flow characteristics, Velocity, Boundary processes, Mathematics, Equations.
Identifiers: *Homogeneous turbulence, Concentration fluctuations, Nonstationarity, Kinematic problem.

A model of particle diffusion in homogeneous turbulence was derived using an approximation concerning the trajectories of the individual fluid particles. The model equation for the mean concentration was in accordance with some exact results, e.g., those for small and large diffusion times, and Taylor's relationship. In the case of a normal velocity distribution, it predicted an almost normal distribution of the mean concentration at all diffusion times. The model was applied also to the concentration fluctuation problem. The resulting equation supported assumptions for large diffusion times found in the literature. The possible application of the model to diffusion in non-homogenous turbulence was touched upon briefly. (Singh - ISWS)
W76-11770

TRAVEL TIMES AND NONLINEARITY OF FLOOD RUNOFF FROM TRACER MEASUREMENT ON A SMALL WATERSHED,
New South Wales Univ., Kensington (Australia), School of Civil Engineering.
D. H. Pilgram.
Water Resources Research, Vol. 12, No. 3, p 487-496, June 1976. 11 fig, 4 tab, 21 ref.

Descriptors: *Travel time, *Tracers, *Flood discharge, *Australia, Velocity, Discharge(Water), Watersheds(Basins), Radioactivity, Low flow, Rainfall, Hydrographs, Spatial distribution, Runoff, Small watersheds.
Identifiers: *Tracer measurements, *Flood magnitude, Linearity, Nonlinearity, Flood timing.

LIBRARY OF THE U. S. GEOLOGICAL SURVEY

Flood runoff was traced from seven injection points to the outlet of a 96-acre watershed. Each radioactivity time record at the outlet provided a hydrograph of outflow of the labeled drop of water. The results yielded direct information on the flood process of a type and accuracy not possible from conventional analysis of rainfall and runoff records. The relationship of travel time and average velocity with discharge were examined together with the variations of these relationships over the watershed. Average travel times were shown to be similar to the watershed lag. The nature of the nonlinearity of the flood runoff process was demonstrated. Although the process was grossly nonlinear at low flows, linearity was approximated at high flows. Spatial variations of travel time and hydrograph shape were shown to make contributions to nonlinearity that were additional to the lumped dependence on flood magnitude that is normally considered. The tracing was carried out on the 96-acre Research Creek watershed near Sydney, Australia, by using the radioisotopes gold 198 and chromium 51-EDTA as tracers. The average stream and surface slopes were 7% and 10%, respectively. (Roberts-ISWS)
W76-11850

ROUGHNESS EFFECTS ON RECTANGULAR FREE OVERFALL,
Alberta Univ., Edmonton. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W76-11855

PEAK FLOW INTER-ARRIVAL TIMES,
Bristol Univ. (England). Dept. of Geography.
For primary bibliographic entry see Field 2A.
W76-11859

WATER RESOURCES AND THEIR DEVELOPMENT IN NIGERIA,
Ibadan Univ. (Nigeria), Dept. of Geography.
For primary bibliographic entry see Field 4A.
W76-11860

TIME OF CONCENTRATION OF OVERLAND FLOW,
Nevada Univ., Reno. Center for Water Resources; and Nevada Univ., Reno. Desert Research Inst.
V. L. Gupta, and P. J. Sinclair.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 102, No. HY4, p 549-553, April 1976. 1 fig, 6 ref, 1 append. OWRT A-057-NEV(3).

Descriptors: *Overland flow, *Time of concentration, *Runoff, Flood flow, Land, Flow rates, Streamflow, Hydrologic cycle, Travel time, Urban drainage, Turbulent flow, Surface runoff, Velocity, Equations, Precipitation excess, Watersheds(Basins).
Identifiers: Surface roughness.

The overland flow phase of the runoff process is considered. Working equations were developed for estimating the time of concentration of overland flow in terms of rainfall excess intensity, length of flow path, Manning's roughness coefficient, and average surface slope. Flow continuity and a turbulent flow regime were assumed. The relationships developed are usable for turbulent flow regime in rural areas as well, in contrast to existing computational aids which are applicable only to restricted urban drainage situations. (Roberts-ISWS)
W76-11958

2F. Groundwater

SPRING FLOW FROM PRE-PENNSYLVANIA ROCKS IN THE SOUTHWESTERN PART OF THE NAVAJO INDIAN RESERVATION, ARIZONA,
Geological Survey, Cheyenne, Wyo.
M. E. Cooley.
Available from Sup. of Documents, GPO, Wash. D. C. 20402 Price $1.05. Professional Paper 521-F, 1976. 15 p, 3 fig, 2 plates, 3 tab, 30 ref.

Descriptors: *Spring waters, *Indian reservations, *Arizona, *New Mexico, *Utah, Groundwater resources, Aquifer characteristics, Hydrogeology, Water quality, Rivers, Inflow, Hydrologic data
Identifiers: *Navajo Indian Reservation(Ariz), Pre-Pennsylvania rocks.

About 220 cubic feet per second (cfs) of spring flow issues from the pre-Pennsylvania rocks in the canyon of the Little Colorado River; the flow is mainly from the Redwall and Muav Limestones, which combine hydraulically to form a multiple-aquifer system. Blue Spring--the largest spring in the Colorado Plateaus physiographic province--discharges about 90 cfs from the left bank of the Little Colorado River. Blue Spring and other nearby springs maintain the perennial flow of the Little Colorado. At the present time, the use of Blue Spring and the other nearby springs for water supplies is not feasible because of (1) the poor chemical quality of the water--more than 2,000 parts per million (ppm) of dissolved solids--and (2) the amount of lift that would be required--about 2,000 feet from the channel of the Little Colorado River to the canyon rim. Water from Vaseys Paradise Spring, in Marble Canyon, contains 163 ppm of dissolved solids; the spring receives its recharge from the Kaibab Plateau, which is only a short distance from Vaseys Paradise. (Woodard-USGS)
W76-11673

GROUND-WATER LEVELS IN SELECTED BASINS IN THE STATE OF UTAH FROM FEBRUARY-MARCH 1974 TO FEBRUARY-MARCH 1975,
Geological Survey, Salt Lake City, Utah.
For primary bibliographic entry see Field 7C.
W76-11678

HYDROLOGIC RECONNAISSANCE OF THE PINE VALLEY DRAINAGE BASIN, MILLARD, BEAVER, AND IRON COUNTIES, UTAH,
Geologicsl Survey, Salt Lake City, Utah.
For primary bibliographic entry see Field 4B.
W76-11683

PRELIMINARY EVALUATION OF THE GROUND-WATER DATA NETWORK IN INDIANA,
Geological Survey, Indianapolis, Ind.
For primary bibliographic entry see Field 7A.
W76-11684

PROBABLE EFFECTS OF INCREASING PUMPAGE FROM THE SCHOFIELD GROUND-WATER BODY, ISLAND OF OAHU, HAWAII,
Geological Survey, Honolulu, Hawaii.
For primary bibliographic entry see Field 4B.
W76-11686

SIMULATED EFFECTS OF THE PROPOSED NARROWS RESERVOIR ON THE WATER-TABLE AQUIFER ALONG THE SOUTH PLATTE RIVER, MORGAN COUNTY, COLORADO,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 4B.
W76-11687

TRANSIENT SIMULATION OF SALTWATER INTRUSION IN SOUTHEASTERN FLORIDA,
Princeton Univ., N. J. Dept. of Civil Engineering; an Princeton Univ., N. J. Water Resources Program.
For primary bibliographic entry see Field 2L.
W76-11689

WATER AND AIR MOVEMENT IN BOUNDED DEEP HOMOGENEOUS SOIL,
Colorado State Univ., Fort Collins. Engineering Research Center
For primary bibliographic entry see Field 2G.
W76-11695

THE AGE OF GROUNDWATER IN THE CHALK OF THE LONDON BASIN,
Atomic Energy Research Establishment, Harwell (England).
D. B. Smith, R. A. Downing, R. A. Monkhouse, I. Otlet, and F. J. Pearson
Water Resources Research, Vol. 12, No. 3, p 394-404, June 1976. 7 fig, 4 tab, 16 ref. U.S. Army 10790-EN.

Descriptors: *Radioactive dating, *Groundwater, *Groundwater basins, *Carbon radioisotopes, Groundwater movement, Pleistocene epoch, Stable isotopes, Radioisotopes, Tritium, Oxygen isotopes, Deuterium, Groundwater recharge, Sampling, On-site investigations, Bicarbonates, Carbonates, Ion exchange, Reduction(Chemical), *Age, *Dating, *Radioactive dating.
Identifiers: *London Basin(England), *Chalk aquifer, Sulfate reduction, Nitrate reduction.

Isotope techniques have been applied to a study of groundwater movement in the Chalk of the London Basin. The 'age' of the water as determined by C14 measurements increases toward the central confined part of the basin where it exceeds 25,000 years and therefore originated during the Pleistocene. The age distribution supports previous interpretations of the permeability pattern partly based on hydrochemistry. Measurements of tritium and the stable isotope ratios of carbon, oxygen, and deuterium were also made. The C13/C12 ratio varied from -13% at outcrop to values less negative than -1% in the central part of the basin which is approaching the value of plus 2.35% for the aquifer matrix. The 018 and deuterium ratios indicate that the Pleistocene waters were recharged at a mean air temperature less than 8°C cooler than that of present day recharge, probably because recharge in the Pleistocene was limited to summer periods because of frozen ground in the winter. (Visocky-ISWS)
W76-11848

HYDROLOGICAL STUDIES OF THE SAGINAW FORMATION IN THE LANSING, MICHIGAN AREA - 1962,
Michigan State Univ., East Lansing. Dept. of Geology.
A. Firouzian.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-242 [illegible] $4.00 in paper copy, $3.00 in microfiche. Technical Report No. 9, December 1970. 29 p, 10 fig, 5 tab, ref.

Descriptors: *Aquifers, *Piezometric, *Potentiometric level, *Michigan, Water table, Groundwater, Groundwater movement, Flow, Pumping, Drawdown, Recharge, Natural recharge, Precipitation(Atmospheric), Rivers, Hydrologic aspects, Geology, Bedrock, Geologic formations, Transmissivity, Hydrology.
Identifiers: *Saginaw formation(Mich), Lansing(Mich), *Grand River(Mich).

The purpose of this investigation was to study the hydrological characteristics of the Saginaw Formation in the Lansing, Michigan area. The water bearing beds of sandstone in the Saginaw Formation are the principal source of water for the greater Lansing area, including the cities of Lansing and East Lansing, Michigan State University, industrial plants, and surrounding townships. The Saginaw Formation is the bedrock formation in the area and is overlain by Pleistocene gla

leposits. The average transmissibility of the Saginaw Formation as determined by flow net nalysis on the basis of 1962 piezometric map is 3,000 gallons per day per foot. The study showed hat the aquifer is recharged from the Grand River t the rate of 3 million gallons per day. The average echarge from precipitation into the aquifer is esti- nated at 4.8 inches per year which is equivalent to 8 million gallons per day based on the recharge rea of an estimated 120 square miles. The amount f water discharged by pumpage is balanced by the mount of water recharged into the area. The cone f depression should remain static if pumpage con- nues at the same rate. (Sims-ISWS)
76-11870

ARRIS-GALVESTON SUBSIDENCE DISTRICT REATED TO 'END' SUBSIDENCE,
arris-Galveston Coastal Subsidence District, ouston, Tex.
or primary bibliographic entry see Field 4B.
76-11919

QUATION OF INFILTRATION WITH COM- RESSION AND COUNTERFLOW EFFECTS,
olorado State Univ., Fort Collins. Dept. of Civil ngineering.
r primary bibliographic entry see Field 2G.
76-11956

STRIBUTED PARAMETER IDENTIFICA- ON OF GROUNDWATER SYSTEMS BY NON- NEAR ESTIMATION,
iversidad de Los Andes, Merida (Venezuela). pt. of Systems Engineering.
L. Garay, Y. Y. Haimes, and P. Das.
rnal of Hydrology, Vol. 30, No. 1/2, p 47-61, y 1976. 2 fig, 3 tab, 15 ref. OWRT B-045- IO(3).

scriptors: *Aquifer systems, *Mathematical dels, *Operations research, *Transmissivity, undwater, Least squares method, Systems lysis, Numerical analysis, Algorithms, Op- ization, Aquifer characteristics, Spatial dis- ution, Boundary processes, Unsteady flow, iations, On-site investigations.
ntifiers: Distributed parameters, Polynomial ctions, Alternate direction implicit technique, erse problem, Output error, Finite-difference nique, Linearization, Sensitivity.

ethod of identifying an aquifer (groundwater) em was presented. The identification problem formulated within a static optimization ework with least-squares error norm as the ctive function. The system model consists of a bolic two-dimensional partial differential tion, with transmissivity as the model's unk- n distributed parameter. The transmissivity assumed to be a polynomial function of areal ibution over the aquifer, where the polynomi- efficients are to be estimated. An alternate tion implicit numerical technique for solving nonlinear parabolic partial differential equa- with irregular boundaries was utilized. The ification problem was solved by using uardt's nonlinear estimation algorithm. A study was undertaken for the aquifer system ayton, Ohio, and computational results ob- d from the model were compared with results an analog simulation model. (Visocky-ISWS) 11957

AGING SOUTH FLORIDA'S GROUND- ER AQUIFER,
al and Southern Florida Control District, Palm Beach.
rimary bibliographic entry see Field 4B.
12002

2G. Water In Soils

SOIL SLIPS, DEBRIS FLOWS, AND RAINSTORMS IN THE SANTA MONICA MOUNTAINS AND VICINITY, SOUTHERN CALIFORNIA,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2E.
W76-11680

WATER AND AIR MOVEMENT IN A BOUNDED DEEP HOMOGENEOUS SOIL,
Colorado State Univ., Fort Collins. Engineering Research Center.
J. Sonu, and H. J. Morel-Seytoux.
Journal of Hydrology, Vol. 29, No. 1/2, p 23-42, March 1976. 13 fig, 23 ref. OWRT B-070-COLO(17). OWRT No. 14-41-0001-3566.

Descriptors: *Soil water movement, *Infiltration rates, Pore pressure, Equations, Mathematical studies, Celerity, Velocity, Porosity, Permeability, Ponding, Rainfall, Infiltration, Saturated soils, Water table, Aquifers, On-site tests, Laboratory tests.
Identifiers: *Soil air movement, Imbibition, Boundary conditions, Saturation profile, Relative permeability, Wetting front, Soil infiltration capacity.

A methodology, based on the knowledge of the characteristic curves of the soil, was presented to predict the infiltration rate into a soil, the evolution of the water content in the soil, and the evolution of the water table under natural hydrological boundary conditions. Comparison with experimental results showed the method to be accurate. Infiltration rate curves were obtained for a number of situations involving different boundary and/or initial conditions. The results confirmed the known experimental facts and the field observations that soil-air behavior is an important factor in infiltration phenomena. (Visocky-ISWS)
W76-11695

EVALUATION OF SOIL SYSTEMS FOR LAND DISPOSAL OF INDUSTRIAL AND MUNICIPAL EFFLUENTS,
North Carolina State Univ., Raleigh. Dept. of Soil Science.
For primary bibliographic entry see Field 5D.
W76-11774

EVAPOTRANSPIRATION FROM A SHORT-GRASS PRAIRIE SUBJECTED TO WATER AND NITROGEN TREATMENTS,
Colorado State Univ., Fort Collins. Natural Resource Ecology Lab.
For primary bibliographic entry see Field 2D.
W76-11849

AN ECOLOGICAL MODEL FOR HEAVY METAL CONTAMINATION OF CROPS AND GROUND WATER,
Royal Danish School of Pharmacy, Copenhagen.
For primary bibliographic entry see Field 5B.
W76-11885

THE INFLUENCE OF SOIL WATER CONTENT ON THE UPTAKE OF IONS BY ROOTS: II. CHLORIDE UPTAKE AND CONCENTRATION GRADIENTS IN SOIL,
Nottingham Univ. (England). School of Agriculture.
R. J. Dunham, and P. H. Nye.
J Appl Ecol. 11(2), p 581-595, 1974.

Descriptors: *Chlorides, *Absorption, *Soil water, *Ions, Roots, Model studies, *Onions.
Identifiers: Concentration gradients.

Uptake and concentration gradients of Cl in soil in the vicinity of a plane of onion roots were measured at a range of soil water contents. Uptake was greater at higher water contents, and the zones of depletion in the soil spread further from the roots. A relatively simple theoretical model of ion transport to roots accounted for the trends among the measured concentration gradients - including an accumulation of Cl at the root surface in 1 case where transpiration was comparatively high. A more detailed model which took account of the water content changes observed during the uptake period satisfactorily reproduced the general shape of the measured gradients, but tended to underestimate the spread of the depletion zones. A possible reason for this was that hydrodynamic dispersion by the water flux to the roots increased the effective diffusion coefficient of Cl thus increased the spread. Although, ideally, the root absorbing power used in the model should have been continuously adjusted to take into account Cl concentration and matric potential changes at the root surface, the values which gave the concentration gradients that fitted most closely to the measured gradients, agreed well with the root absorbing powers calculated from the measured uptake. At higher soil water contents these values of the root absorbing power also agreed with those obtained for onion seedlings growing in stirred nutrient solution. At lower soil water contents, however, when the matric potential at the root surface fell to about - 25 bar, the root absorbing power was lower (approximately x 0.2) than that for nutrient solution.--Copyright 1975, Biological Abstracts, Inc. (See also W75-08330)
W76-11925

EQUATION OF INFILTRATION WITH COMPRESSION AND COUNTERFLOW EFFECTS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
H. J. Morel-Seytoux, and J. Khanji.
Hydrological Sciences Bulletin, Vol. 20, No. 4, p 505-517, December 1975. 7 fig, 1 tab, 10 ref. OWRT B-070-COLO(18). 14-31-0001-3566.

Descriptors: *Infiltration, *Infiltration rates, *Mathematical studies, *Air, *Simulation analysis, Equations, Groundwater, Groundwater movement, Soil water movement, Unsaturated flow, Compressibility, Compressible flow, Capillary action, Zone of aeration.
Identifiers: *Cumulative infiltration, Time function, Two-phased flow, Air pressure.

There are several mechanisms by which air affects the infiltration process. In a previous article (See W75-01126) only the viscous resistance to simultaneous flow of water and air was considered. In addition there are other effects: the compression effect, the buoyancy effect, the counterflow effect, the hysteresis effect, and several others. Even though all these effects occur, simultaneously, it is convenient to treat them at first separately and progressively in partial combinations. In this article the compression effect and then the compression and counterflow effects were added to the viscous resistance effect. Formulae for cumulative infiltration versus time were derived. Without the counterflow effect, the functional form of the equation is similar to that of Green and Ampt with two additional correction terms, one for the total viscous resistance effect and one for the compression effect. With counterflow the derived formula no longer has the Green and Ampt functional form. The derived formula remains quite simple. (Morris-ISWS)
W76-11956

ADSORPTION OF PICLORAM (4-AMINO-3,5,6-TRICHLOROPICOLINIC ACID) ON PANOCHE, EPHRATA, AND PALOUSE SOILS: A THERMODYNAMIC APPROACH TO THE ADSORPTION MECHANISM,
California Univ., Davis. Dept. of Water Science and Engineering.
For primary bibliographic entry see Field 5B.

W76-12142

REDOX POTENTIALS IN SOIL COLUMNS INTERMITTENTLY FLOODED WITH SEWAGE WATER,
Mississipi State Univ., State College. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W76-12145

COLORIMETRIC DETERMINATION OF PARAQUAT RESIDUES IN SOIL AND WATER,
Environmental Protection Agency, Athens, Ga. Southeast Environmental Research Lab.
For primary bibliographic entry see Field 5A.
W76-12149

2H. Lakes

SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART II. PACIFIC SLOPE BASINS IN CALIFORNIA--VOLUME I. BASINS FROM TIJUANA RIVER TO SANTA MARIA RIVER,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W76-11669

A FICKIAN ANALYSIS OF LAKE SEDIMENT UPSURGE,
Arkansas Univ., Fayetteville. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 2J.
W76-11692

ECOLOGY OF PLANKTONIC INFUSORIA OF SECONDARY-OLIGOTROPHIC LAKE, (IN RUSSIAN),
Gorkii State Univ. (USSR).
For primary bibliographic entry see Field 5C.
W76-11728

THE IMPORTANCE OF ZOOPLANKTON IN THE METABOLISM OF LAKE SCHIEREN, (IN GERMAN),
For primary bibliographic entry see Field 5C.
W76-11735

CHARACTERISTICS AND PRODUCTION POTENTIALS OF ZOOPLANKTON FROM LAKE SHCHELKUN IN THE MIDDLE URALS, (IN RUSSIAN),
Ural and Siberian Fishery Scientific-Research and Planning Inst., Sverdlovsk (USSR).
For primary bibliographic entry see Field 5C.
W76-11737

THE LAKE TEXCOCO (MEXICO) SEDIMENTS AND THEIR CAPACITY TO SUPPORT VEGETATION, (IN FRENCH),
Toulouse-3 Univ. (France).
For primary bibliographic entry see Field 2J.
W76-11738

PHYTOPLANKTON, PRODUCTION AND BREAKDOWN OF ORGANIC MATTER IN THE KUIBYSHEV RESERVOIR, (IN RUSSIAN),
Akademiya Nauk SSSR, Tolyatti. Institut Biologii Vnutrennykh Vod.
For primary bibliographic entry see Field 5C.
W76-11739

METHODS FOR COMPUTING THE EVAPORATION OF LAKE FERTOE, (IN GERMAN),
Orszagos Meteorologiai Intezet, Budapest (Hungary). Zentralanst. Atmos. Phys.
For primary bibliographic entry see Field 2D.
W76-11741

MEASUREMENT OF LAKE ICE THICKNESS WITH A SHORT-PULSE RADAR SYSTEM,
National Aeronautics and Space Administration, Cleveland, Ohio. Lewis Research Center.
For primary bibliographic entry see Field 7B.
W76-11753

NITROGEN CYCLING IN MICROCOSMS AND APPLICATION TO THE BIOLOGY OF THE NORTHERN ARM OF THE GREAT SALT LAKE,
Utah State University, Logan. Dept of Biology.
For primary bibliographic entry see Field 5C.
W76-11778

THE REPRODUCTIVE BIOLOGY OF THE LEECH HELOBDELLA STAGNALIS (L.) IN UTAH LAKE, UTAH,
Brigham Young Univ., Provo, Utah. Dept. of Zoology.
D. L. Tillman, and J. R. Barnes.
Freshwater Biol. 3(2), p 137-145, 1973.

Descriptors: *Utah, *Reproduction, *Annelids, Biology, Lakes, Temperature.
Identifiers: Gametogenesis, Helobdella-Stagnalis, *Leeches, *Utah Lake(Utah).

The reproductive biology of the glossiphoniid leech H. stagnalis in Utah Lake, Utah(USA), was studied for an 18-mo. period from June 1970-Dec. 1971. In this lake the overwintering adult leeches produce 2 broods of young in May and June. Evidence is presented to support the idea that the same individual can produce 2 broods. Two complete cycles of gametogenesis also take place. Continuous water temperatures were recorded at the study site to correlate with reproductive activity. Gametogenesis appears to be temperature dependent with the 1st generation of sperm taking 4 mo. to be produced in the fall and winter months while the 2nd generation of sperm is produced in 6 wk during the spring. Egg production follows a similar pattern.--Copyright 1973, Biological Abstracts, Inc.
W76-11826

INTERNATIONAL FIELD YEAR FOR THE GREAT LAKES.
International Field Year for the Great Lakes (IFYGL) Bulletin No. 18, May 1976. 101 p, 17 fig, 6 tab. (Great Lakes Environmental Research Laboratory, Ann Arbor, Michigan).

Descriptors: *Great Lakes, *International waters, *International Hydrological Decade, *Canada, *United States, *Lake Ontario, Programs, Publications, Bibliographies, Water temperature, Currents(Water), Lakes.
Identifiers: *International Field Year for the Great Lakes.

Listed were the official International Field Year for the Great Lakes (IFYGL) publications, joint Canadian-U.S. publications included in previous IFYGL Bulletins, and additions to the IFYGL bibliography. Information presented for Lake Ontario included monthly mean temperatures at 15 and 30 meter depths for May through November. Brief reports on both Canadian and U.S. scientific projects were included. Canadian and U.S. summaries of data available from IFYGL archives were tabulated. (Sims-ISWS)
W76-11847

TURBULENT ENTRAINMENT AT THE DENSITY INTERFACE OF A TWO-LAYER STABLY STRATIFIED FLUID SYSTEM,
Johns Hopkins Univ., Baltimore, Md., Dept. of Earth and Planetary Science.
For primary bibliographic entry see Field 2L.
W76-11871

ECOSYSTEM MODELING OF WAT HYACINTH MANAGEMENT IN LAKE ALI FLORIDA,
Florida Univ. Gainesville. Dept. of Environmental Engineering Sciences
For primary bibliographic entry see Field 5G
W76-11884

INTERNATIONAL MANAGEMENT OF GREAT LAKES-ST. LAWRENCE BASIN,
Western Ontario University. London. Can Department of Geography University of Wes Ontario, London. Dept. of Geography.
J. C. Day
Water Resources Bulletin, Vol. 8, No. 6, p 1136, December 1972. 7 fig, 1 tab, 46 ref.

Descriptors: *International waters, *Great La *Management, *Fisheries, *River ba *International Joint Commission, St. Lawr River, St. Lawrence Seaway, Canada, U States, Water quality, Air quality, Dams, Na tion, Hydroelectric power, Treaties, Diversion
Identifiers: International cooperation, Boun water levels.

Neither Canada nor the United States attach importance to the International Joint Commi (IJC), judging by the size of staffs and a budgets. The Commission has been restricted relatively minor number of functions in the Lakes-St Lawrence Basin. It has investigated degree and causes of water and air quality d oration; the effects of hydroelectric and na tion projects on water levels; the impacts of w level fluctuations; and the feasibility of a waterway from the St. Lawrence to the Hu River. Projects approved by the Commission produced less than might be expected throu fault of the Commission. The Great Lakes Fi Commission has promoted little internat management. Budgetary limitations restri lamprey control program; institutional limita restrict its ability to deal effectively with fi problems. Commission responsibilities are li to coordination and advisory functions. Canada and the United States have not cho refer most aspects of river basin manageme international bodies, an institutional void ex the Great Lakes Basin to consider these que on a continuous basis. There is a need fo panded international cooperation. (Bell-Corn
W76-11887

THE ROLE OF BENTHIC METABOLISM BOG LAKE,
Connecticut Univ., Storrs. Inst. of Resources.
For primary bibliographic entry see Field 5C
W76-11906

BENTHIC METABOLISM OF A SOFT-W LAKE,
Connecticut University, Storrs.
For primary bibliographic entry see Field 5C
W76-11907

RELEASE OF DISSOLVED ORGANIC MA BY AUTOLYSIS OF A SUBME MACROPHYTE, SCIRPUS SUBTERMINA
National Inst. for the Environment, Te (Japan).
For primary bibliographic entry see Field 5C
W76-11942

THE BATTLE OF LAKE SUPERIOR: RES MINING'S BIG SEWER,
For primary bibliographic entry see Field 5C
W76-12020

THERMAL STRATIFICATION AND HE MECHANISMS IN A SMALL LAKE,
Alberta Univ., Edmonton. Dept. of Botany.

M. Hickman.
Arch Hydrobiol. 74(1), p 60-67, 1974.

Descriptors: *Lakes, *Thermal stratification, Europe, Cycles, Seasonal, Turbulence, Hypolimnion, *Heat transfer, *Water temperature.
Identifiers: *Abbot's Pond(England), U.K.

Seasonal temperature cycles in Abbot's Pond England) are very similar each yr. The coefficient f eddy turbulence was similar when mean values ere considered. However, in 1968 and 1969, the eating patterns did not follow the empirical equaons, indicating other factors were involved in the ansport of heat through the hypolimnion.--Copyght 1975, Biological Abstracts, Inc.
76-12139

ARBON-13 ENRICHED CARBONATE IN INERSTITIAL WATERS OF LAKE KINNERET EDIMENTS,
eizmann Inst. of Science, Rehovoth (Israel). ept. of Isotope Research.
or primary bibliographic entry see Field 5C.
76-12140

I. Water In Plants

HE ROLE OF THE AQUATIC EXCHANGE OF ARBON DIOXIDE IN THE ECOLOGY OF THE ATER HYACINTH (EICHHORNIA CRASPES),
orida Univ., Gainesville. Dept. of Zoology.
R. Ultsch, and D. S. Anthony.
Sci. 36(1), p 16-22, 1973.

scriptors: *Carbon dioxide, Ecology, *Water acinth, Root systems, Absorption, Plant ysiology.
ntifiers: Carbon-14.

vels of dissolved CO2 under the mats formed by floating water hyacinth were found to reach els as high as 60 mm Hg. Field data suggest that 2 is being removed from the water in the time by the extensive root system of the water cinths and might be available for photosynthe- Experiments with 14C-labeled bicarbonate ify that the water hyacinth is capable of fixing olved CO2, and this source probably accounts at least 10% of the total C fixed by this plant.--yright 1975, Biological Abstracts, Inc.
6-11921

TER STRESS SUSPENDS LEAF AGEING,
mmonwealth Scientific and Industrial Research anization, St. Lucia (Australia). Div. of TropiAgronomy.
M. Ludlow, and T. T. Ng.
t Sci. Lett. 3(4), p 235-240, 1974.

criptors: *Photosynthesis, Leaves, Inhibition, ing(Biological), Hydration.
tifiers: Panicum-maximum-var-trichoglume, escence, *Green panic, *Water stress, *Leaf r potentials.

water potentials less than -- 12 bars inhibited hotosynthesis of green panic (Panicum max- var. trichoglume), and suspended the normal ne of photosynthesis associated with leaf , until the stress was relieved and active net synthesis recommended. This suspension of synthetic decline occurred at stress levels to approximately -- 90 bars provided leaves ot die as a direct result of water stress (as op- to death associated with normal escence). The photosynthetic mechanism was ermanently affected by these levels of stress after rewatering, surviving leaves attained greater than control leaves of the same ological age but comparable with those of same physiological age.--Copyright 1975, gical Abstracts, Inc.
11934

STRUCTURE AND FUNCTION OF STREAM ECOSYSTEMS,
Michigan State Univ., Hickory Corners. W. K. Kellogg Biological Station.
K. W. Cummins.
Bioscience. 24(11), p 631-642, 1974.

Descriptors: *Ecosystems, *Streams, Classification, *Organic matter, *Carbon dioxide, *Plant growth, Systematics, Biology.

General functional, interrelated components were defined and initially dimensioned for representative stream ecosystems. Additional or alternative functional criteria are sought to replace classical taxonomic units. Attention is now focussed on efficient conversion of organic matter to CO2 and the mantainance of a minor role for instream plant growth.--Copyright 1975, Biological Abstracts, Inc.
W76-12137

2J. Erosion and Sedimentation

A FICKIAN ANALYSIS OF LAKE SEDIMENT UPSURGE,
Arkansas Univ., Fayetteville. Dept. of Chemical Engineering.
L. Thibodeaux, and C. K. Cheng.
Water Resources Bulletin, Vol. 12, No. 2, p 221-236, April 1976. 6 fig, 4 tab, 10 ref. OWRT A-026-ARK(2).

Descriptors: *Lake sediments, *Thermal stratification, *Epilimnion, *Nutrients, *Model studies, Sediment-water interfaces, Eutrophication, Sediment distribution, Analytical techniques, Turbulence, Seasonal.
Identifiers: *Sediment upsurge, *Fickian type models, Equinoxes.

During the period between the vernal and autumnal equinox, the net heat transfer into the lake is positive, and lake stratification occurs with a stable water column consisting of warm water above and cold water below. Some lakes experience reverse stratification in winter but in March the lake is usually at uniform conditions with respect to temperature and chemical species concentration. The stratified-mixed states which occur annually in lakes play a dominant role in the movement of nutrient-rich material from the lake bottom upward into the water column. The semi-infinite slab energy model to represent the lake surface temperature, thermal profile, and thermocline position was extended to include a Fickian type model for the upsurge of nutrients from the sediment-water interface upward. Relations were developed for the rate of nutrient upwelling into the epilimnion and the photoactive zone of a lake. A lake time constant was developed from the model equations. This constant is considered important for predicting the likelihood of a fall algal bloom. Results on model verification attempts on three lakes were presented. (Singh-ISWS)
W76-11692

THE USE OF MULTIPLE REGRESSION MODELS IN PREDICTING SEDIMENT YIELD,
Arizona Univ., Tuscon. Dept. of Management.
J. E. Weber, M. M. Fogel, and L. Duckstein.
Water Resources Bulletin, Vol. 12, No. 1, p 1-17, February 1976. 9 fig, 4 tab, 9 ref. OWRT B-043-ARIZ(2)and B-032-ARIZ(24).

Descriptors: *Sediment yield, *Regression analysis, *Model studies, *Watershed management, *Analytical techniques, Design, Erosion, Particle size, Soil types, Statistics.
Identifiers: *Model choice, Multiple linear regression, Data transformation.

Four commonly used models for predicting sediment yield were analyzed and compared using previously published data. Three of these models involved logarithmic transformations. Some of the problems involved in transforming data were discussed in the context of logarithmic transformations. The test data pertained to 39 watersheds in 11 western states, varying in size from a few acres to more than 50 square miles. Slope erosion is the only major sediment source in these watersheds. Standard regressions using the four models and test data illustrated the problems that may be caused by transformations. The standard regression analysis and the economic loss function analysis indicated that a linear model is preferable for predicting sediment yields. If any transformation is made to satisfy the normality assumptions of linear regression analysis, it should be determined from the distribution of the sample residuals. (Singh-ISWS)
W76-11693

THE LAKE TEXCOCO (MEXICO) SEDIMENTS AND THEIR CAPACITY TO SUPPORT VEGETATION, (IN FRENCH),
Toulouse-3 Univ. (France).
J. C. Revel, V. Ojeda, and J. Rivera.
Bull Assoc Fr Etude Sol. 3, p 193-200, 1974.

Descriptors: *Lakes, *Mexico, *Lake sediments, *Vegetation, *Salts, Gels, Leaching, Salinity, Dehydration, Permeability, Alkalinity, Drying.
Identifiers: *Lake Texcoco(Mexico).

The drying of Lake Texcoco left bare stretches of impermeable, saline and alkaline sediments, unsuitable for any kind of vegetation. The properties of the salt sediments ('jaboncillo') are due to a gel, liable to irreversible dehydration, making the sediments permeable and prone to leaching.--Copyright 1975, Biological Abstracts, Inc.
W76-11738

CONSTRUCTION AND STABILIZATION OF COASTAL FOREDUNES WITH VEGETATION: PADRE ISLAND, TEXAS,
Texas Tech Univ., Lubbock. Dept. of Range and Wildlife Management.
For primary bibliographic entry see Field 2L.
W76-11752

THE COLVILLE RIVER AND THE BEAUFORT SEA: SOME INTERACTIONS,
Louisiana State Univ., Baton Rouge. Dept. of Geography and Anthropology.
For primary bibliographic entry see Field 2L.
W76-11767

RIVERBANK FORMS OF THE COLVILLE RIVER DELTA,
Aberdeen Univ., (Scotland), Dept. of Geography.
For primary bibliographic entry see Field 2L.
W76-11769

BULK DENSITY-WATER CONTENT RELATIONSHIP IN MARINE SILTS AND CLAYS,
Lehigh Univ., Bethlehem, Pa.
For primary bibliographic entry see Field 2L.
W76-11771

TEMPORAL CHANGES IN THE OFFSHORE ISLANDS OF MISSISSIPPI,
Mississippi Univ., University. Dept. of Geology and Geological Engineering.
T. H. Waller, and L. P. Malbrough.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-257 150, $5.50 in paper copy, $3.00 in microfiche. Mississippi Water Resources Research Institute, Mississippi State, Completion Report, July 1976. 109 p, 32 fig, 49 ref, 3 append. OWRT A-098-MISS(1).

Descriptors: Beaches, Erosion, *Deposition(Sediments), *Mississippi, Gulf of Mexico, *Barrier islands, *Temporal distribution,

*Beach erosion, *Shores, Sediments, Cycles, Tropical cyclones.
Identifiers: Sea level changes.

Historical monitoring of Mississippi's barrier islands (Petit Bois, Horn, Ship, Cat) records the nature and magnitude of changes in position of the shoreline and provides insight into the factors affecting those changes. Documentation of long-term changes from available records involved repetitive sequential mapping of shoreline positions using vintage coastal topographic charts and aerial photographs. Long-term trend or direction of shoreline changes averaged over the 124-year time period (1848 to 1973) indicate that maximum net rates of accretion (16 to 125 feet per year) were recorded on the western ends of Petit Bois, Horn, and Ship islands and North Point of Cat Island. Maximum net erosion (44 to 322 feet per year) dominated the eastern ends of Petit Bois, Horn, and Ship islands and South Spit of Cat Island. Net loss of land during the 124-year time period amounted to 1800 acres or over 18 percent of the land area in 1848. The major factors affecting shoreline changes are deficit in sediment supply, high frequency impact of tropical cyclones, and sea-level changes. Comparison of shorelines indicates definite short-term cycles of erosion related to storms (primarily hurricanes) and partial recovery during intervening years of low storm incidence.
W76-11905

THE ROLE OF BENTHIC METABOLISM IN A BOG LAKE,
Connecticut Univ., Storrs. Inst. of Water Resources.
For primary bibliographic entry see Field 5C.
W76-11906

BENTHIC METABOLISM OF A SOFT-WATER LAKE,
Connecticut University, Storrs.
For primary bibliographic entry see Field 5C.
W76-11907

OFFSHORE SEDIMENT TRANSPORT AND EQUILIBRIUM BEACH PROFILES,
Waterloopkundig Laboratorium, Delft (Netherlands).
For primary bibliographic entry see Field 2L.
W76-11937

2K. Chemical Processes

SPRING FLOW FROM PRE-PENNSYLVANIA ROCKS IN THE SOUTHWESTERN PART OF THE NAVAJO INDIAN RESERVATION, ARIZONA,
Geological Survey, Cheyenne, Wyo.
For primary bibliographic entry see Field 2F.
W76-11673

A PRELIMINARY EVALUATION OF THE CHEMICAL CHARACTER OF WATER NEAR THE NORTHWEST SHORE OF TOPAZ LAKE, DOUGLAS COUNTY, NEVADA,
Geological Survey, Carson City, Nev.
For primary bibliographic entry see Field 5A.
W76-11674

APPRAISAL OF THE WATER RESOURCES OF CHARLOTTE COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 4C.
W76-11676

HYDROLOGIC RECONNAISSANCE OF THE PINE VALLEY DRAINAGE BASIN, MILLARD, BEAVER, AND IRON COUNTIES, UTAH,
Geologicsl Survey, Salt Lake City, Utah.
For primary bibliographic entry see Field 4B.
W76-11683

THE AGE OF GROUNDWATER IN THE CHALK OF THE LONDON BASIN,
Atomic Energy Research Establishment, Harwell (England).
For primary bibliographic entry see Field 2F.
W76-11848

REGIONAL CHARACTERISTICS OF THE TOTAL DISSOLVED MINERALS IN STREAM WATERS IN ILLINOIS,
Northern Illinois Univ., DeKalb. Dept. of Geology.
For primary bibliographic entry see Field 5A.
W76-11857

AN EVALUATION OF THE MILLER METHOD FOR DISSOLVED OXYGEN ANALYSIS,
Wollongong Univ. Coll. (Australia). Div. of Biology and Chemical Sciences.
For primary bibliographic entry see Field 5A.
W76-12144

COLORIMETRIC DETERMINATION OF PARAQUAT RESIDUES IN SOIL AND WATER,
Environmental Protection Agency, Athens, Ga. Southeast Environmental Research Lab.
For primary bibliographic entry see Field 5A.
W76-12149

2L. Estuaries

TRANSIENT SIMULATION OF SALTWATER INTRUSION IN SOUTHEASTERN FLORIDA,
Princeton Univ., N. J. Dept. of Civil Engineering; an Princeton Univ., N. J. Water Resources Program.
G. Segol, and G. F. Pinder.
Water Resources Research, Vol 12, No. 1, p 65-70, February 1976. 8 fig, 12 ref. OWRT C-5224(4214)(3).

Descriptors: *Saline water intrusion, *Aquifers, *Florida, *Model studies, *Mathematical models, Groundwater, Sea water, Subsurface waters, Interfaces, Saline water-freshwater interfaces, Rainfall, Pumping, Coasts, Water table, Water levels, Water quality.
Identifiers: *Biscayne aquifer(Fla).

The Galerkin-finite element method can be used to simulate the two-dimensional movement of the saltwater front in the Cutler area of the Biscayne aquifer near Miami, Florida. The concentration distributions for steady state and transient conditions can be obtained by using pressure head data mesured in the field for formulating boundary conditions. The numerical results were found to be in satisfactory agreement with the experimental data. Discrepancies observed in the central part of the aquifer between field and computed values were thought to indicate the presence of a higher-permeability region. (Sims-ISWS)
W76-11689

DDT PLUS PCB'S IN BLUBBER OF HARBOR SEALS,
National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
For primary bibliographic entry see Field 5A.
W76-11698

POLLUTION OF THE MEDITERRANEAN AROUND NAPLES,
Durham Univ. (England). Dept. of Botany.
For primary bibliographic entry see Field 5B.
W76-11713

WILDFOWL AND POLLUTION IN THE TA ESTUARY,
Dundee Coll. of Technology (Scotland). Dept. Physics.
For primary bibliographic entry see Field 5C.
W76-11714

EXPORT OF LEAD FROM SALT MARSHES,
Marine Biological Lab., Woods Hole, Ma Boston Univ. Marine Program.
For primary bibliographic entry see Field 5B.
W76-11717

MERCURY CONTENT OF MUSSELS FRO WEST EUROPEAN COASTS,
Central Lab. TNO, Delft (Netherlands)
For primary bibliographic entry see Field 5B.
W76-11718

DIETARY HABITS AND HEAVY METAL CO CENTATIONS IN FISH FROM THE SEVE ESTUARY AND BRISTOL CHANNEL,
Bath Univ. (England).
For primary bibliographic entry see Field 5C.
W76-11721

SEASONAL VARIATION OF DISSOLV METALS IN INSHORE WATERS OF T MENAI STRAITS,
University Coll. of North Wales, Bangor. Ma Science Labs.
For primary bibliographic entry see Field 5B.
W76-11722

MERCURY ENRICHMENT IN ESTUAR PLANT DETRITUS,
Florida State Univ., Tallahassee. Dept. Oceanography.
For primary bibliographic entry see Field 5C.
W76-11724

SEABIRD MORTALITY IN THE NORTH IR SEA AND FIRTH OF CLYDE EARLY IN 197
Royal Society for the Protection of Birds, S (England).
For primary bibliographic entry see Field 5C.
W76-11727

ON THE PROROCENTRUM RED TIDE CURRED IN THE COASTAL WATERS TOYOURA, FUNKA BAY, HOKKAIDO, IN TEMBER, 1973, (IN JAPANESE),
For primary bibliographic entry see Field 5C.
W76-11740

A THREE-DIMENSIONAL NUMERI MODEL OF THE ESTUARY CIRCULAT AND SALINITY IN NARRAGANSETT BAY,
Rhode Island Univ., Kingston. Graduate Sch Oceanography.
K. W. Hess.
Estuarine and Coastal Marine Science, Vol. 4 3, p 325-338, May 1976. 5 fig, 17 ref.

Descriptors: *Model studies, *Estuaries, * *Mathematical models, Rivers, Discharge(W *Salinity, Water quality, Circulation, Water lation, Coasts, Tidal waters, Bays, Depth, A cal techniques, Equations, Hydrodyna *Rhode Island, *Path of pollutants.
Identifiers: *Narragansett Bay(RI), Three-d sional models.

Gravitational circulation in an estuary produced primarily by longitudinal densit ferences, but other factors, such as local raphy, the Coriolis acceleration, and lateral ty variations may be equally important. A ge ized three-dimensional rigid-lid model steady, density-driven flow was form

hich includes spatial variations in depth, eddy scosity and diffusivity, and horizontal pressure adients. An equation of steady salt conservation as also solved, including convection, based on e gravitation circulation and diffusion in the ree directions. Some details of the numerical mputations were presented and comparisons th observations from Narragansett Bay were aluated. Cyclonic circulation predicted by the odel was discussed as an example of its capabili-s. (Sims-ISWS)
76-11746

S ANGELES AND LONG BEACH HARBORS ODEL STUDY; REPORT 1, PROTOTYPE TA ACQUISITION AND OBSERVATIONS,
ny Engineer Waterways Experiment Station, cksburg, Miss. Hydraulics Lab.
primary bibliographic entry see Field 8B.
6-11751

NSTRUCTION AND STABILIZATION OF ASTAL FOREDUNES WITH VEGETATION: ORE ISLAND, TEXAS,
as Tech Univ., Lubbock. Dept. of Range and dlife Management.
. Dahl, B. A. Fall, A. Lohse, and S. G. Appan.
ilable from the National Technical Informa- Service, Springfield, Va. 22161, as ADA-018- $7.50 inpaper copy, $3.00 in microfiche. stal Engineering Research Center Miscellane- Paper No. 9-75 September 1975. 188 p, 57 fig, ab, 89 ref, 2 append.

criptors: *Coastal engineering, *Shore protec- *Vegetation establishment, *Erosion control, as, Vegetation effects, Coasts, Beaches, h erosion, Soil erosion, Tidal effects, es(Water), Dunes, Sands, Wind erosion, Plant lations, Soil conservation, Soil stabilization, r crops, Grasses, Planting management.
tifiers: *Padre Island(Tex), Beach grasses, ats, Bitter panicum.

riments were conducted from 1969 to 1974 on e Island, Texas, to establish technical specifi-ns and methodologies for use of beach es to construct and stabilize foredunes as surge barriers along the gulf coast. Bitter um and sea oats were the best adapted spe- for beach plantings. The most successful od of establishing vegetated dune ridge was planting these grasses on the backshore, e they trapped, grew through, and stabilized nulating sand. Foredunes were established s overwash channels by creating an elevated, elatively salt-free surface using parallel rows ot-high sand fencing, and then transplanting rasses. (See also W75-10887) (Sims - ISWS) 1752

ICATION OF REMOTELY SENSED MUL-CTRAL DATA TO AUTOMATED ANALY-F MARSHLAND VEGETATION,
al Aeronautics and Space Administration, on, Tex. Lyndon B. Johnson Space Center. Cibula.
Technical Note D-8139, February 1976. 31 g, 3 tab, 13 ref.

ptors: *Remote sensing, *Marshes, nds, *Louisiana, Aerial photography, l marshes, Salt marshes, Vegetation, Clas-on, Estuaries, Mosquitoes, Insects, Com- programs, Data processing, Analytical ques, Instrumentation.

water-to-brackish marsh near Slidell, Loui- was studied to demonstrate the use of ly sensed data from an airborne multispec-nner and computer processing technique ntifying and classifying vegetational cover rmine areas that are potential breeding sites salt marsh mosquito, Aedes sollicitans. ting ground investigations were performed to locate areas of uniform plant species plant communities for use as calibration sites, or 'training fields,' in the computer analysis. The spectral signatures of these training fields provided the basis for computer decisions on the classification of vegetational complexes in the total study area. Later ground studies indicated a high degree of accuracy in the overall classification. The computer programs used for processing the data were developed at the Purdue University Laboratory for Application of Remote Sensing and modified for this study. In the CLASSIFY program, the digital table look-up method was found to be the fastest and the most economical. (Sims - ISWS)
W76-11754

DEVELOPMENT OF AN AIRBORNE LASER BATHYMETER,
National Aeronautics and Space Administration, Wallops Island, Va. Wallops Flight Center.
For primary bibliographic entry see Field 7B.
W76-11755

THE COLVILLE RIVER AND THE BEAUFORT SEA: SOME INTERACTIONS,
Louisiana State Univ., Baton Rouge. Dept. of Geography and Anthropology.
H. J. Walker.
Available from the National Technical Information Service, Springfield, Va 22161, as AD-A009 549, $4.00 in paper copy, $3.00 in microfiche. Technical Report No. 186, June 1975. 28 p, 23 fig, 20 ref. Reprinted from The Coast and Shelf of the Beaufort Sea, The Arctic Institute of North America, Arlington, Virginia, p 513-540, 1974. ONR N00014-69-A-0211-0003.

Descriptors: *Arctic, *Rivers, *Deltas, *Alaska, Permafrost, Cold regions, Estuaries, Oceans, Floods, Floodwater, Saline water-freshwater interfaces, Flow, Streamflow, Salinity, Ice, Tundra, Sediments, Suspended solids, Sedimentation, Drainage, Hydrology.
Identifiers: *Colville River(Alaska), *Beaufort Sea(Alaska).

Rivers which originate within the zone of continuous permafrost virtually cease flow during winter so that for a period of several months no fresh water or sediment is transported to the ocean. The Colville River in northern Alaska, which is of this type, was studied to determine the nature of the interactions between river and ocean during breakup. By the end of winter the subaqueous portion of the delta consists of a band of snow-covered bottomfast ice which extends seaward to about 2-m depth, a 2- to 3-m ice cover seaward of the bottomfast ice, hypersaline water in unfrozen pockets in the zone of bottomfast ice, and sea water of normal salinity seaward thereof. Spring floodwaters first flush the winter sea water from the delta channels and then flow seaward both over and under the sea ice. Water moving over the sea ice eventually drains through cracks in the ice, but only after much sediment has been deposited. The floodwater beneath the ice advances seaward as a wedge and maintains a sharp interface with the sea water beneath. Although little mixing occurs across the interface during flooding, some suspended material nonetheless settles through to the bottom. Intense flooding normally lasts less than 2 weeks after which the relatively warm fresh water gradually mixes with the cold marine water to create the brackish water system that prevails throughout the summer. (Sims-ISWS)
W76-11767

RIVERBANK FORMS OF THE COLVILLE RIVER DELTA,
Aberdeen Univ., (Scotland), Dept. of Geography.
W. Ritchie, and H. J. Walker.
Available from the National Technical Information Service, Springfield, Va 22161, as AD-A009 550, $3.50 in paper copy, $3.00 in microfiche. Technical Report No. 187, June 1975. 18 p, 12 fig, 2 tab, 2 ref. Reprinted from The Coast and Shelf of the Beaufort Sea, The Arctic Institute of North America, Arlington, Virginia, p 545-562, 1974. ONR N00014-69-A-0211-0003.

Descriptors: *Arctic, *Rivers, *Deltas, *Alaska, Permafrost, Cold regions, Banks, Erosion, Bank erosion, Sediments, Suspended solids, Sedimentation, Ice, Tundra, Geomorphology, Hydrology.
Identifiers: *Colville River(Alaska).

The Colville River delta, about 600 sq km in area, has a number of distributaries which empty into the Beaufort Sea across a 45-km front. Distributary banks are composed of a variety of matrials, including peats, gravels, sands, and finer sediments. In addition, because the delta is in the zone of continuous permafrost, banks are frozen and contain several ice forms, including ice wedges. Of the nine types of banks identified, four are erosional, four depositional, and one neutral. The ratio of erosional to depositional banks is about 12:7, with right-hand banks being 72% erosional and left-hand banks 46% erosional. Depositional forms include large-scale river bars and point bars. Low river stages during summer render these bars analogous to beaches, and a sequence of dunes have formed along most riverbanks with a northeast exposure. Thermal erosion and thermal melting are responsible for the development of niches near the base of the banks and for digitate troughs leading back from the river along ice wedges. Bank collapse and block slumping are common, and large amounts of deltaic sediment are contributed to the river and transported seaward. The specific morphologic characteristics of erosional banks vary with bank materials, river stage, current velocity and aspect. (Sims - ISWS)
W76-11769

BULK DENSITY-WATER CONTENT RELATIONSHIP IN MARINE SILTS AND CLAYS,
Lehigh Univ., Bethlehem, Pa.
A. F. Richards, T. J. Hirst, and J. M. Parks.
Available from the National Technical Information Service, Springfield, Va 22161, as AD-A012 047, $3.50 in paper copy, $3.00 in microfiche. Journal of Sedimentary Petrology, Vol. 44, No. 4, p 1004-1009, December 1974. 4 fig, 33 ref. ONR N00014-67-A-0370-0005, NOAA 1-35357 and NG-2-72.

Descriptors: *Sediments, *Oceans, *Silts, *Clays, Bulk density, Moisture content, Bottom sediments, Measurement, Laboratory tests, Regression analysis, Equations, On-site investigations, Cores, Sedimentation.
Identifiers: *Marine sediments.

Bulk density and water content were defined and then related to one another and to void ratio by 7 polynomial regression equations based on 1680 measured bulk density and water content values of water-saturated sediments from the Atlantic and Pacific Oceans and other areas. Theoretical relationships between bulk density, water content, and void ratio for specific gravities between 2.30 and 2.85 were demonstrated. The average specific gravity of 2.72 found for the data presented compared favorably to similar values reported in the literature. Use can be made of the regression equations to compute e log p bar sedimentation-compression curves entirely determined from the bulk density of water-saturated sediment measured nondestructively by laboratory or in situ nuclear transmission densitometers. In an example showing the consolidation of a fine-grained calcareous sediment from the Exuma Sound, Bahamas, the all-nuclear laboratory method compared favorably with the conventional, non-nuclear method of constructing e log p bar curves. The combination of suitable regression equations and the all-nuclear method is equally applicable to other fine-grained water-saturated sediments. (Sims - ISWS)
W76-11771

EVALUATION OF SLUDGE DUMPING OFF DELAWARE BAY,
Delaware Univ., Lewes. Coll. of Marine Studies.
For primary bibliographic entry see Field 5B.
W76-11792

MARINE STUDIES OF SAN PEDRO BAY, CALIFORNIA. PART III. THERMAL TOLERANCE AND SEDIMENT TOXICITY STUDIES,
University of Southern California, Los Angeles. Allan Hancock Foundation.
For primary bibliographic entry see Field 5C.
W76-11793

THERMAL EFFECTS AND SAN PEDRO BAY,
University of Southern California, Los Angeles. Allan Hancock Foundation.
For primary bibliographic entry see Field 5C.
W76-11794

EFFECTS OF SUB-NORMAL TEMPERATURES ON SOME COMMON LOS ANGELES HARBOR ANIMALS,
University of Southern California, Los Angeles. Allan Hancock Foundation.
For primary bibliographic entry see Field 5C.
W76-11796

PRELIMINARY INVESTIGATIONS OF THE EFFECTS OF RESUSPENDED SEDIMENT ON TWO SPECIES OF BENTHIC POLYCHAETES FROM LOS ANGELES, HARBOR,
University of Southern California, Los Angeles. Allan Hancock Foundation.
For primary bibliographic entry see Field 5C.
W76-11799

FIN EROSION IN WINTER FLOUNDER,
National Marine Fisheries Service, Highlands, N. J. Sandy Hook Sport Fisheries Marine Lab.
For primary bibliographic entry see Field 5C.
W76-11809

INCIDENCE OF POLYCHLORINATED BIPHENYLS IN CLYDE SEAWEED,
Leeds Univ. (England). Wellcome Marine Lab.
For primary bibliographic entry see Field 5C.
W76-11810

EUTROPHICATION OF A PARTIALLY ENCLOSED ESTUARINE MUDFLAT,
National Inst. for Physical Planning and Construction Research, Dublin (Ireland).
For primary bibliographic entry see Field 5C.
W76-11811

EFFECTS OF PETROLEUM ON ESTUARINE BACTERIA,
Maryland Univ., College Park. Dept. of Microbiology.
For primary bibliographic entry see Field 5C.
W76-11814

INTERTIDAL ORGANISMS OF AN INDUSTRIALIZED ESTUARY,
Paisley Coll. of Technology (Scotland). Dept. of Biology.
For primary bibliographic entry see Field 5C.
W76-11815

POLLUTION OF HONG KONG'S COMMERCIAL OYSTER BEDS,
Hong Kong Univ. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W76-11817

INTERTIDAL FAUNA OF THE INDUSTRIALIZED FORTH ESTUARY,
Stirling Univ. (Scotland). Dept. of Biology.
For primary bibliographic entry see Field 5C.
W76-11818

POLYSTYRENE SPHERULES IN THE SEVERN ESTUARY-A PROGRESS REPORT,
Bath Univ. (England). School of Biological Sciences.
For primary bibliographic entry see Field 5B.
W76-11819

ELIMINATION OF HYDROCARBONS BY MUSSELS,
Instituto di Biologia del Mare, Venice (Italy).
For primary bibliographic entry see Field 5C.
W76-11822

DEVICE FOR DAMPING WAVES,
Mitsui Shipbuilding and Engineering Co. Ltd., Tokyo (Japan). (Assignee).
For primary bibliographic entry see Field 8B.
W76-11825

GRAVITY WAVES PROPAGATED OVER PERMEABLE BOTTOM,
Polish Academy of Sciences, Gdansk. Inst. of Hydraulic Research.
For primary bibliographic entry see Field 8B.
W76-11853

PARAMETERS AFFECTING STABILITY OF RUBBLE MOUNDS,
Norges Tekniske Hoegskole, Trondheim. Institutt for Anleggsdrift og Havnebygging.
For primary bibliographic entry see Field 8B.
W76-11854

TURBULENT ENTRAINMENT AT THE DENSITY INTERFACE OF A TWO-LAYER STABLY STRATIFIED FLUID SYSTEM,
Johns Hopkins Univ., Baltimore, Md., Dept. of Earth and Planetary Science.
L. H. Kantha.
Available from the National Technical Information Service, Springfield, Va 22161 as ADA-016 607, $6.75 in paper copy, $3.00 in microfiche, Technical Report 75-1, August 1975. 162 p, 77 fig, 3 tab, 35 ref, 5 append. ONR N00014-75-C-0700, NSF DES72-01549-A02.

Descriptors: *Turbulent boundary layers, *Entrainment, *Mixing, Density, Turbulence, Shear, Laboratory tests, Salinity, Interfaces, Saline water-freshwater interfaces, Equipment, Model studies, Hydraulic models, Lakes, Oceans.
Identifiers: *Turbulent entrainment.

This report deals with the turbulent entrainment at the density interface of a stable two-layer stratified fluid, resulting from the application and maintenance of a constant shear stress at the top of the upper layer. The investigation is the continuation of the experiments reported earlier by Kato and Phillips (see W70-0183). It was found that the entrainment rate (defined as the ratio of the entrainment velocity to the friction velocity) is a general function of the interface Richardson number (Ri) and is not restricted to a power law with a unique index over the Richardson number range investigated (30-1100). The function can, however, be approximately fitted by a power law Ri to the (-n) power over limited ranges of Ri, but then the index n depends on the Ri range and is a monotonic function of Ri. The results seem to resolve the existing controversy on whether the entrainment should follow the Ri to the (-1) or (-3/2) power law. Furthermore, the entrainment rates observed were considerably higher than those obtained by Kato and Phillips. (Sims-ISWS)
W76-11871

OFFSHORE BARS ALONG THE ALASK ARCTIC COAST,
Louisiana State Univ., Baton Rouge. Coastal S dies Inst.
A. D. Short.
Available from the National Technical Infor tion Service, Springfield, Va 22161 as ADA- 035, $3.50 in paper copy, $3.00 in microfic Technical Report No. 183, June 1975 13 p, 14 2 tab, 13 ref. Reprinted from Journal of Geolo Vol. 83, p 209-221, 1975. ONR N00014-69-A-02 0005.

Descriptors: *Sand bars, *Coasts, *Arctic Oce *Alaska, Waves(Water), Ocean wa Geomorphology, Beaches, Shores, Aerial pho raphy, On-site investigations, Bathymetry, T dra, Sands, Cold regions.
Identifiers: *Offshore bars, Bar migration.

Well-developed offshore bars along the 1,355- long Alaskan Arctic coast possess three distinc forms: (1) multiple parallel bars containing in and outer bar systems; (2) long, parallel bars curring in series but attached to the shore at t updrift ends; and (3) shorter en echelon bars tached to the shore. Some short en echelon are migrating to the west at a rate of 70 m/yr moving sediment on the order of 400,000 cu m Bars attached to the beaches generate pronoun shoreline rhythms consisting of horns and b with amplitudes up to 200 m and lengths of 4-5 Low beach-ridge and swale systems are prese on the horns and destroyed in the bays. The b where the beach is narrowest, tend to coin with locations of inlets or erosion of the tu hinterland. Field evidence strongly indicated variation in bar forms is related to the angl dominant wave approach to the shore; bars ten be shorter and more transverse to the shore w waves arrive at large angles, and longer and r parallel to the shore where waves arrive n parallel to the shore. (Sims-ISWS)
W76-11873

A MODEL OF PATCHINESS FOR PR PREDATOR PLANKTON POPULATIONS,
Liege Univ. (Belgium) Institut of Mathematiqu
For primary bibliographic entry see Field 5C.
W76-11878

A BOUNDARY VALUE APPROACH ESTUARINE WATER QUALITY MODELI WITH RESULTS FOR JAMAICA BAY, YORK,
Texas Univ. at Austin. Dept. of Electrical gineering.
For primary bibliographic entry see Field 5B.
W76-11881

PLASTIC PARTICLES IN SURFACE WA OF THE NORTHWESTERN ATLANTIC,
National Marine Fisheries Service, Narraga R.I. Narragansett Lab.
For primary bibliographic entry see Field 5B.
W76-11889

TEMPORAL CHANGES IN THE OFFSH ISLANDS OF MISSISSIPPI,
Mississippi Univ., University. Dept. of Ge and Geological Engineering.
For primary bibliographic entry see Field 2J.
W76-11905

METHOD OF CONTROL OF LAND WATER USES IN THE COASTAL ZONE,
George Washington Univ., Washington, D. C
For primary bibliographic entry see Field 6E
W76-11922

TROLEUM DEGRADATION IN LOW TEM-RATURE MARINE AND ESTUARINE EN-RONMENTS,
ode Island Univ., Kingston. Dept. of Plant hology-Entomology.
primary bibliographic entry see Field 5B.
6-11924

ASTAL ZONE POLLUTION BY OIL AND HER CONTAMINANTS: GUIDELINES FOR LICY, ASSESSMENT AND MONITORING IN OPICAL REGIONS. BASED UPON A CASE UDY IN INDONESIA, IN 1973,
thsonian Institution, Washington, D. C.
primary bibliographic entry see Field 5B.
5-11935

FSHORE SEDIMENT TRANSPORT AND UILIBRIUM BEACH PROFILES,
erloopkundig Laboratorium, Delft therlands).
I. Swart.
ilable from the National Technical Informa- Service, Springfiel Va 22161, as N75-26615, 5 in paper copy, $3.00 in microfiche. Delft raulics Laboratory Doctor's thesis, Publica- No. 131, 1974; Delft Hydraulics Laboratory ort M918, Part 2, 1974. 318 p, 89 fig, 18 tab, 54

criptors: *Sediment transport, *Beaches, gineering structures, *Prototypes, *Models es, Groines(structures).
tifiers: *Equilibrium beach profiles, *Wave n.

redictive model, based on both model and otype data, is developed to enable the compu- n of the offshore sediment transport on sandy hes under wave action, as well as of the cor- onding time-dependent and eventual equilibri- each profiles. The offshore transport taking in the D-profile (the real developing profile) e subject of this report. The time-dependent on of the backshore and growth of the transi- rea only serve as boundary conditions for the ss in the D-profile. An analysis is made of the al mechanism, in order to lead to a sche- ation, which is as close as possible to the ac- physical process. The schematization is ed out more thoroughly and derived in its form. The area of applicability of the theory rived and correlated to the available model rototype data. The bed material in all tests for evaluation was sand, the median particle ters ranged between 011 mm and 0.227 mm. e number of tests in which onshore transport red is negligible, only tests in which offshore ort occurred were used in this study. The were processed according to the developed atization and the results are presented and ated. The steps that are to be followed in the ation of the method are summarized. (Sinha S)
1937

LTS OF OCEAN DIFFUSION AND OGICAL STUDIES OF THE HOL-OOD, FLORIDA, OCEAN OUTFALL,
onmental Science and Engineering, Inc., sville, Fla.
imary bibliographic entry see Field 5B.
1938

OIL AND GAS - AN ENVIRONMENTAL SSMENT. A REPORT TO THE PRE- T BY THE COUNCIL ON ENVIRONMEN- UALITY, VOLUME 1.
il on Environmental Quality, Washington,

mary bibliographic entry see Field 6G.
1947

OCS OIL AND GAS - AN ENVIRONMENTAL ASSESSMENT. A REPORT TO THE PRESIDENT BY THE COUNCIL ON ENVIRONMENTAL QUALITY, VOL 5, POTENTIAL BIOLOGICAL EFFECTS OF HYPOTHETICAL OIL DISCHARGES IN THE ATLANTIC COAST AND GULF OF ALASKA.
Massachusetts Inst. of Tech., Cambridge, Mass.
For primary bibliographic entry see Field 6G.
W76-11952

OCS OIL AND GAS - AN ENVIRONMENTAL ASSESSMENT. A REPORT TO THE PRESIDENT BY THE COUNCIL ON ENVIRONMENTAL QUALITY, VOL 5. OIL SPILL TRAJECTORY STUDIES FOR ATLANTIC COAST AND GULF OF ALASKA.
Massachusetts Inst. of Tech., Cambridge, Mass.
For primary bibliographic entry see Field 6G.
W76-11955

HEAVY METALS IN ORGANISMS OF THE ATLANTIC COAST OF S.W. SPAIN AND PORTUGAL,
Bristol Univ. (England). School of Chemistry.
For primary bibliographic entry see Field 5B.
W76-11961

ARSENIC IN MARINE ORGANISMS FROM WEST GREENLAND,
B. C. Research Ltd., Vancouver.
For primary bibliographic entry see Field 5C.
W76-11962

CADMIUM LEVELS AND CARBOHYDRATE METABOLISM IN LIMPETS,
Bristol Polytechnic (England). Dept. of Science.
For primary bibliographic entry see Field 5C.
W76-11963

TRACE METAL CONTENT IN THE AMERICAN OYSTER,
National Marine Fisheries Service, Milford, Conn. Milford Lab.
For primary bibliographic entry see Field 5C.
W76-11964

DISTRIBUTION OF SOME TRACE METALS IN POOLE HARBOUR, DORSET,
Imperial Coll. of Science and Technology, London (England). Applied Geochemistry Research Group.
For primary bibliographic entry see Field 5B.
W76-11965

TRACE METALS IN OYSTERS FROM KNYSNA ESTUARY,
National Physical Research Lab., Pretoria (South Africa).
H. R. Watling, and R. J. Watling.
Marine Pollution Bulletin, Vol. 7(3): 1976, p. 45-48, 4 tab., 2 fig., 12 ref.

Descriptors: Water pollution effects, *Metals, *Oysters, *Zinc, *Cadmium, *Copper, *Iron, Manganese, *Nickel, Silver, Pathology(Animal), Aquatic animals, Trace elements, Benthos, Estuarine environment, Africa.
Identifiers: *Trace-metal pollution, *Crassostrea, *Ostrea, Tissue content, Metal content, *Knysna estuary(South Africa).

A preliminary survey of seven trace metals in three species of oyster from the Knysna estuary, South Africa, has been carried out. The results indicate that this area is as yet unpolluted; the data provide baseline levels against which future trace-metal pollution can be measured. Two species of oyster are being grown at a number of sites as part of a long-term program to monitor trace-metal levels in the estuary. (Katz)
W76-11966

REDUCED GROWTH AND SURVIVAL OF CLAMS TRANSPLANTED TO AN OIL SPILL SITE,
Maine State Dept. of Marine Resources, Augusta.
For primary bibliographic entry see Field 5C.
W76-11968

HINDGUT MICROFLORA FROM OIL-POLLUTED SOFT-SHELL CLAMS,
Rhode Island Univ., Kingston. Dept. of Plant Pathology-Entomology.
For primary bibliographic entry see Field 5C.
W76-11969

THE ILLUSORY TREASURE OF DAVY JONES' LOCKER,
Southern Connecticut State Coll., New Haven. Dept. of Geography.
For primary bibliographic entry see Field 6E.
W76-11972

PROTECTION OF THE MARINE ENVIRONMENT,
National Petroleum Council, Washington, D. C. Committee on Ocean Petroleum Resources.
For primary bibliographic entry see Field 5G.
W76-11982

DISTRIBUTION AND ABUNDANCE OF THE POLYCHAETOUS ANNELIDS IN A SOUTH FLORIDA ESTUARY,
University of South Florida, Tampa. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W76-11987

OFFSHORE SEGMENT OF THE OIL AND GAS EXTRACTION POINT SOURCE CATEGORY.
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-11994

LAW OF THE SEA: A STATE MUST EXERCISE SUBSTANTIAL CONTINUOUS AND RECOGNIZED AUTHORITY TO ESTABLISH A BODY OF WATER AS A HISTORIC BAY,
For primary bibliographic entry see Field 6E.
W76-12004

SALT MARSHES-ECOSYSTEMS IN DANGER,
Cape Cod Museum of Natural History, Brewster, Mass.
For primary bibliographic entry see Field 5G.
W76-12016

OCEANS, TECHNOLOGY AND LAW.
Akademiya Nauk SSSR, Moscow. Inst. of State and Law.
For primary bibliographic entry see Field 6E.
W76-12025

FEDERAL JURISDICTION OVER LANDFILLS ON SUB-AQUEOUS LANDS,
Spessard L. Holland Law Center, Gainesville, Fla.
For primary bibliographic entry see Field 6E.
W76-12046

USE OF THE 'TRUST DOCTRINE' FOR WETLANDS PROTECTION,
Spessard L. Holland Law Center, Gainesville, Fla.
For primary bibliographic entry see Field 6E.
W76-12047

PUBLIC BEACH ACCESS: GUARANTEEING A PLACE TO SPREAD YOUR TOWEL,
Spessard L. Holland Law Center, Gainesville, Fla.
For primary bibliographic entry see Field 6E.

W76-12053

COASTAL ZONE MANAGEMENT IN FLORIDA: THE NEED FOR A COMPREHENSIVE PROGRAM,
Spessard L. Holland Law Center, Gainesville, Fla.
For primary bibliographic entry see Field 6E.
W76-12055

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

WATER TREATMENT DEVICE WITH TRANSISTORIZED CIRCUIT,
Water Technology Service, Inc., Cleveland, Ohio. (Assignee).
For primary bibliographic entry see Field 5F.
W76-11833

3B. Water Yield Improvement

LIQUID LIFTING AND STORAGE APPARATUS AND METHOD,
B. Y. Cotton.
U.S. Patent No. 3,958,424, 3 p, 4 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 946, No 4, p 1509, May 25, 1976.

Descriptors: *Patents, Groundwater, *Groundwater resources, *Water supply, *Moisture availability, Runoff, Capillary flow, Capillary action, Water storage, Water resources development, Irrigation, *Water sources, *Water yield improvement.
Identifiers: Lifting groundwater.

Moisture in cultivated fields, orchards is largely dissipated by absorption into the earth and/or evaporation. A great amount of rainfall is lost due to the fact that during any substantial rainfall, the soil soon becomes saturated and subsequent rainfall is lost by runoff. Therefore, it is the primary object of this invention to provide new and improved methods and apparatus for lifting and retaining ground water in agricultural and other environments. Specifically the invention comprises a planar horizontal flat supporting base of brick, sand, concrete or tile normally embedded below ground level providing support for a lifting and storing unit consisting of one or more vertically oriented webs of glass or the like formed in a spiral of equidistantly closely spaced adjacent convolutions. Adjacent convolutions are closely spaced together so that the capillary effect between adjacent faces of the convolutions serves to lift water upward between the convolutions to a height above its normal level determined by the spacing of the convolutions and the material from which they are formed. The inner extent of the lifting and storing unit consists of a central core cylinder and the outer extent consists of a peripheral cylinder coaxial with the core cylinder with the spiral web or webs extending between the outer surface of the central core cylinder and the inner surface of the outer peripheral cylinder. The spiral web or webs can be of a number of desired materials having a low wetting angle such as glass, ceramic material or the like. (Sinha - OEIS)
W76-11840

PROJECT SKYWATER, A PROGRAM OF RESEARCH IN PRECIPITATION MANAGEMENT, VOLUME I OF II (DRAFT ENVIRONMENTAL STATEMENT).
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
Report INT DES 76-10, Volume I, March 5, 1976. 271 p, 40 fig, 39 tab.

Descriptors: *Weather modification, *Cloud seeding, *Water resources, *Environmental effects, Cloud physics, Water resources development, Rainfall, Snowfall, Precipitation(Atmospheric), Water management(Applied), Water supply, Clouds, Mountains, Agriculture, Projects, Meteorology.
Identifiers: *Environmental impact statements.

Project Skywater is a research cloud seeding effort designed to remove scientific uncertainties and develop the technology required to make cloud seeding a scientifically sound and socially acceptable water resources management tool. The field seeding experiments have been conducted thus far at selected sites in the Western States. Supporting studies are conducted throughout the nation, but mostly in the West. Field experiments are conducted in the mountains during the winter and in the plains during the summer. The primary impact of the program's research activities are insignificant, believed to be a slight but unidentifiable increase in plant growth and stream discharge. If the technology anticipated to be developed from the program is applied continuously over wide areas, the impact would be significant in increased agricultural plant growth and in increased streamflow from mountainous regions. The incidence of avalanche occurrence probably would be increased. Research to date has failed to identify adverse impacts related to seeding agents or significant adverse effects related to managed precipitation. Alternatives considered were termination of project, expansion of conventional water resources engineering, exploitation of groundwater resources, interbasin diversion, desalinization, reuse of degraded water, and land management for increased water yield. (See also W76-11869) (Sims-ISWS)
W76-11868

PROJECT SKYWATER, A PROGRAM OF RESEARCH IN PRECIPITATION MANAGEMENT, VOLUME II OF II (DRAFT ENVIRONMENTAL STATEMENT).
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
Report INT DES 76-10, Volume II, March 5, 1976. 191 p, 25 fig, 70 tab, 242 ref.

Descriptors: *Weather modification, *Cloud seeding, *Environmental effects, Hydrology, Meteorology, Ecology, Agriculture, Economics, Social aspects, Social impact, Projects, Mountains, Hydrologic cycle, Rainfall, Snowfall, Precipitation(Atmospheric), Water resources.
Identifiers: *Environmental impact statements, *High plains, Seeding agents.

Volume II of the Project Skywater Draft Environmental Statement consists of 10 appendixes. Included are descriptions of the hydrologic cycle, condensation, precipitation in the atmosphere, seeding agents, and the Sierra Cooperative Pilot Project. Other appendixes describe the High Plains. Hydrometeorological, ecological, agricultural, economic, and social descriptions are presented. Also included is a bibliography and a glossary. (See also W76-11868) (Sims-ISWS)
W76-11869

EARTH'S HIDDEN ASSET, OUR MOST VALUABLE SOURCE OF WATER IS ALSO THE MOST VULNERABLE,
For primary bibliographic entry see Field 4B.
W76-11895

EFFECT OF COAL MULCH ON CROP YIELDS,
Agricultural Research Service, Cheyenne, Wyo.
For primary bibliographic entry see Field 3F.
W76-11926

3C. Use Of Water Of Impaired Quality

THE ENVIRONMENTAL AND SOCIOLOGICAL IMPACT OF RECYCLING OF AGRICULTURAL WASTE BY LAND USE,
Green Valley Farms, Avondale, Pa.
For primary bibliographic entry see Field 5D.
W76-11641

IRRIGATION OF LEASED FARMLAND WITH TREATED WASTEWATER,
Hickok (Eugene A) and Associates, Wayzata, Minn.
For primary bibliographic entry see Field 5D.
W76-11667

3D. Conservation In Domestic and Municipal Use

URBAN DRAINAGE - PROBLEMS AND POSSIBILITIES,
Nova Scotia Technical Coll., Halifax. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W76-11648

THE SYMBIOTIC APPROACH TO WATER REUSE IN ST. PETERSBURG, FLORIDA,
Black, Crow and Eidsness, Inc., Clearwater, Fla.
For primary bibliographic entry see Field 5D.
W76-11656

SOLID WASTE, SEWAGE, AND ENERGY - SYMBIOTIC APPROACH,
Energy Management Group, New York.
For primary bibliographic entry see Field 5D.
W76-11657

PROJECT CURE,
Environmental Protection Agency, Cincinnati, Ohio.
For primary bibliographic entry see Field 5D.
W76-11661

SOURCES AND POTENTIAL USES OF SALVAGEABLE WATERS IN ARIZONA URBAN REGIONS,
Arizona Water Resources Research Center, Tucson.
For primary bibliographic entry see Field 5D.
W76-11663

BENEFICIAL USE OF INDUSTRIAL WASTE IN MUNICIPAL WASTEWATER TREATMENT PLANTS,
Greeley and Hansen, Chicago, Ill.
For primary bibliographic entry see Field 5D.
W76-11668

RESERVOIR EFFECTS ON PROPERTY VALUES ACCORDING TO LOCATION AS RURAL VS. URBAN USE,
Kentucky State Univ., Frankfort. School of Public Affairs.
For primary bibliographic entry see Field 4A.
W76-11708

3E. Conservation In Industry

PRACTICAL APPLICATIONS OF SPACE SYSTEMS, SUPPORTING PAPER 6, EXTRACTABLE RESOURCES.
National Research Council, Washington, D. Panel on Extractable Resources.
For primary bibliographic entry see Field 4A.

W76-11759

POTENTIAL PUMPED STORAGE PROJECTS N THE PACIFIC SOUTHWEST.
Federal Power Commission, Washington, D.C. Bureau of Power.
For primary bibliographic entry see Field 8C.
W76-11764

WATER POLLUTION CONTROL ACT OF 1972, CONOMIC IMPACTS, MEAT PRODUCTS,
Development Planning and Research Associates, nc., Manhattan, Kans.
or primary bibliographic entry see Field 5G.
776-11779

WATER POLLUTION CONTROL ACT OF 1972, EGIONAL IMPACTS, YELLOWSTONE IVER BASIN.
Stevens, Thompson and Runyan, Inc. Seattle, Wash.
or primary bibliographic entry see Field 5G.
76-11789

ATER POLLUTION CONTROL ACT OF 1972, CONOMIC IMPACTS, DAIRY PRODUCTS.
evelopment Planning and Research Associates, c., Manhattan, Kans.
r primary bibliographic entry see Field 5G.
76-11801

ATER POLLUTION CONTROL ACT OF 1972, CONOMIC IMPACTS, FOREIGN TRADE,
blic Research Inst., Arlington, Va.
r primary bibliographic entry see Field 5G.
76-11802

ATER POLLUTION CONTROL ACT OF 1972, ONOMIC IMPACTS, FRUITS AND VEGETA-ES.
velopment Planning and Research Associates, ., Manhattan, Kans.
primary bibliographic entry see Field 5G.
6-11803

TER POLLUTION CONTROL ACT OF 1972, CHNOLOGIES AND ECONOMIC IMPACTS, E FEEDLOT INDUSTRY,
velopment Planning and Research Associates, , Manhattan, Kans.
primary bibliographic entry see Field 5G.
5-11804

TER POLLUTION CONTROL ACT OF 1972, MOGRAPHIC AND QUANTITATIVE ANAL-S,
nan Resources Planning Inst., Seattle, Wash.
primary bibliographic entry see Field 5G.
-11805

ERIM REPORT, COOPERATIVE GRAYS RBOR SURVEILLANCE PROGRAM-1970,
hington State Dept. of Ecology, Olympia. Of- of Technical Services.
primary bibliographic entry see Field 5D.
-11894

LIMINARY RESULTS WITH A PILOT NT WASTE RECYCLING MARINE-ACULTURE SYSTEM,
ds Hole Oceanographic Institution, Mass.
primary bibliographic entry see Field 5D.
-11932

ERSTATE WATER COMPACTS AND ERAL DEVELOPMENT,
e, Picotte and Pauly, Helena, Mont.
ble.

Rocky Mountain Mineral Law Institute, Vol 21, p 777-800 (1975). 24 p, 66 ref.

Descriptors: *Water resources, *Energy, *Energy conversion, *Interstate compacts, *Coal mines, Rivers, State governments, Coordination, Legislation, Water sources, Water law, Water levels, Water utilization, Water yield, Mineral industry, Water demand, Colorado.
Identifiers: *Yellowstone River Compact.

The increasing energy shortage has brought into focus the need to exploit our coal reserves in Montana, Wyoming, North Dakota and South Dakota. Whether gasification or liquifaction is used to change coal into gas or petroleum, large-amounts of water will be needed to make either process work. The Yellowstone River Compact supposedly is equal to the task of judiciously appropriating water for energy needs in this region. However, after examination of this and other water compacts, the author concludes that they are, by and large, hopelessly outdated to meet water demands of mineral development. Overall, any pronounced effort to appropriate large amounts of water will result in extensive letigation and a re-negotiation of the Yellowstone Compact. (Frank-Florida)
W76-11977

EFFLUENT LIMITATIONS GUIDELINES FOR EXISTING SOURCES AND STANDARDS OF PERFORMANCE AND PRETREATMENT STANDARDS FOR NEW SOURCES FOR THE PAVING AND ROOFING MATERIALS (TARS AND ASPHALT) POINT SOURCE CATEGORY.
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-11989

POLLUTION CONTROL IN MEAT, POULTRY AND SEAFOOD PROCESSING,
For primary bibliographic entry see Field 5D.
W76-12146

3F. Conservation In Agriculture

AGRICULTURAL ENGINEERING WATER RESOURCES INFORMATION RETRIEVAL OF PUBLISHED LITERATURE,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 10D.
W76-11691

ESTIMATING STOCK WATER USE IN RURAL WATER SYSTEMS,
Burns and McDonnell, Kansas City, Mo.
R. S. Schulz, and T. A. Austin.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 102, No. HY1, Proceedings Paper 11843, p 15-28, January 1976. 14 fig, 2 tab, 12 ref. OWRT A-048-IA (5).

Descriptors: *Agriculture, *Stock water, *Water demand, *Iowa, Livestock, Water utilization, Design criteria, Regional development, Water supply, Air temperature, Rural areas, Farms, Correlation analysis.

Recently there has been an increase in the number of regional water supply systems in the Midwest. These systems often serve large livestock populations in addition to the domestic needs within the region. Peak use periods in a rural water supply system with large livestock populations are longer than those seen in high density residential areas. The increased length of peak use can be attributed to livestock feeding operations, but it is not possible to distinguish between the domestic and livestock influences at any particular time. Peak rates of use were found to occur between 7 a.m. and 11 a.m. and 4:30 p.m. and 8:30 p.m. The nomographs indicating daily livestock water consumption developed from data collected in the literature appeared to give reasonable predictions of livestock water requirements based on animal weight and average temperature (Sims-ISWS)
W76-11696

IRRIGATION WITH CITRUS WASTE WATER,
Agricultural Research and Education Center, Lake Alfred, Fla.
For primary bibliographic entry see Field 5D.
W76-11699

OVERLAND FLOW PRETREATMENT OF WASTEWATER,
North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering.
For primary bibliographic entry see Field 5D.
W76-11775

PIVOT SPRINKLER,
H. R. Farris, and C. J. Johnson.
U.S. Patent No. 3,957,204, 8 p, 13 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 946, No 3, p 1093, May 18, 1976.

Descriptors: *Patents, *Irrigation, *Sprinkler irrigation, *Irrigation practices, *Irrigation efficiency, Water conveyance, Water distribution(Applied), Application equipment.
Identifiers: *Pivot sprinkler.

A pivot sprinkler incorporates an elongate irrigation pipe having a number of sprinklers for irrigating a land area. The pipe is supported by spaced supporting towers each of which is provided with supporting wheels and a drive mechanism. One end of the pipe is rotatably supported from and connected to a standpipe. Controls are provided for retaining the support towers generally in aligned conditions with the elongate pipe extending through the rotational center and forming rotational support for a drive wheel on each of the towers. Each wheeled unit includes a smaller trailing wheel oriented to the rear of the drive wheel and connected to the irrigation pipe by a frame structure for transmitting driving torque exerted by the drive wheel to the ground surface and stabilizing the wheeled unit. Spray nozzles are mounted so that they will discharge water to the rear of the machine leaving the wheel traction area relatively dry. (Sinha - OEIS)
W76-11829

SPRINKLER,
R. B. Costa.
U.S. Patent No. 3,957,205, 7 p, 9 fig, 13 ref; Official Gazette of the United States Patent Office, Vol 946, No 3, p 1093, May 18, 1976.

Descriptors: *Patents, *Irrigation, *Sprinkler irrigation, *Irrigation practices, *Irrigation efficiency, Irrigation operation and maintenance, Application equipment.

A sprinkler head is fixed to a tubular spindle which is rotatably journaled in and spring biased upward relative to a bearing sleeve, and has improved upper and lower seals for sealing the clearance space between the spindle and bearing sleeve against the entrance of water, dirt, grit and the like. The upper seal includes a seal ring which is retained by the spring in sealing force on the sprinkler head and has a depending annular flexible sealing lip surrounding and engaging a circumferential sealing surface on the bearing sleeve in such a way that if the spindle presses downward through the bearing sleeve against spring action, the seal ring wipes or scrapes dirt and grit from the sealing surface to prevent jamming of the seal ring during the upward spring return of the spindle. The lower seal, which serves also as a spindle thrust bearing, is particularly useful on a water actuated impulse sprinkler and includes a carbon-graphite

seal ring cushioned between resilient seal rings for providing the friction necessary for proper operation of the water actuated impulse driving means of the sprinkler. (Sinha - OEIS)
W76-11830

LIQUID LIFTING AND STORAGE APPARATUS AND METHOD,
For primary bibliographic entry see Field 3B.
W76-11840

WATER DISCHARGE DEVICE FOR USE WITH IRRIGATION SYSTEMS,
Hitachi Chemical Co. Ltd., Tokyo (Japan). (Assignee).
S. Watanabe.
U.S. Patent No. 3,958,761, 5 p, 5 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 946, No 4, p 1624, May 25, 1976.

Descriptors: *Patents, *Irrigation, *Surface irrigation, *Irrigation systems, *Irrigation practices, *Irrigation efficiency, Water distribution(Applied), Application equipment, Water pressure, Fertilization, Discharge(Water).

A water discharge device for use with irrigation systems comprises a tubular element formed with female threads at the inside surface and a screw element formed with male threads at the outside surface. The male threads are adapted to engage with the female threads so that the height of the female threads is different from that of the male threads. Since the height of the female threads is different from that of the male threads, a helical clearance is left between the engaging threads providing a pressure reducing passage for the water supplied at a relatively high pressure to be moderately discharged. The fluctuations of the flow rate due to deformations of the elements of the water discharge device under application of a fluctuating hydraulic pressure are avoided. The pressure reduction through the helical passage can be easily controlled by adjusting the depth of engagement between the tubular element and the screw element by turning one relative to the other. (Sinha-OEIS)
W76-11843

THE INFLUENCE OF SOIL WATER CONTENT ON THE UPTAKE OF IONS BY ROOTS: II. CHLORIDE UPTAKE AND CONCENTRATION GRADIENTS IN SOIL,
Nottingham Univ. (England). School of Agriculture.
For primary bibliographic entry see Field 2G.
W76-11925

EFFECT OF COAL MULCH ON CROP YIELDS,
Agricultural Research Service, Cheyenne, Wyo.
M. L. Fairbourn.
Agron J. 66(6), p 785-789, 1974.

Descriptors: *Crop production, *Mulching, *Coal, Colorado, Soil water, Soil temperation, *Evaporation control, Porosity.

A study was conducted at Fort Collins, Colorado to determine if a mulch of 1.0 to 3.0 -cm diameter coal pieces would reduce evaporation of soil water and increase soil temperature. Treatments of coal mulch and bare soil were used in both laboratory and field experiments to determine not only the effects on soil water and soil temperature, but also soil fertility and light regime for plants. The coal pieces broke down rapidly and became intergrated with the surface soil. The experimental methods showed that the coal mulch effects on soil fertility and light regime were negligible. However, the mulch increased soil water storage compared with a bare soil. The response appeared to be due to a change in soil porosity of the surface, wetting depth and soil cracking. Increased soil temperature seemed to be the dominant factor that caused a prominent plant response from a coal mulch. Plants on the coal mulch plots became established rapidly, grew vigorously, and matured early which resulted in higher yields than those from a bare soil treatment. The experiment indicated that low grade coals, soft coals, or coal-soil mixtures can be used to increase production from agricultural and horticultural plants.--Copyright 1975, Biological Abstracts, Inc.
W76-11926

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

URBAN DRAINAGE - PROBLEMS AND POSSIBILITIES,
Nova Scotia Technical Coll., Halifax. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W76-11648

LOWER WALLER CREEK MASTER IMPROVEMENT PLAN,
Taniguchi, Shefelman, Vackar, and Minter, Austin, Tex.
For primary bibliographic entry see Field 5D.
W76-11662

SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART II. PACIFIC SLOPE BASINS IN CALIFORNIA--VOLUME I. BASINS FROM TIJUANA RIVER TO SANTA MARIA RIVER,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W76-11669

FLOOD HYDROLOGY OF BUTTE BASIN 1973 AND 1974 WATER YEARS, SACRAMENTO VALLEY, CALIFORNIA--A PROGRESS REPORT,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 2E.
W76-11670

MAP SHOWING SELECTED EXTREME-STREAMFLOW STATISTICS AND DRAINAGE AREAS, GREATER PITTSBURGH REGION, PENNSYLVANIA,
Geological Survey, Harrisburg, Pa.
For primary bibliographic entry see Field 7C.
W76-11671

MANUAL FOR ESTIMATING FLOOD CHARACTERISTICS OF NATURAL-FLOW STREAMS IN COLORADO,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 2E.
W76-11672

FLOODS OF MAY-JULY 1975, ALONG THE CONTINENTAL DIVIDE IN MONTANA,
Geological Survey, Helena, Mont.
For primary bibliographic entry see Field 2E.
W76-11675

A LAND USE AND LAND COVER CLASSIFICATION SYSTEM FOR USE WITH REMOTE SENSOR DATA,
Geological Survey, Reston, Va.
J. R. Anderson, E. E. Hardy, J. T. Roach, and R. E. Witmer.
Available from Supt. of Documents, GPO, Wash D. C. 20402 price $0.75. Professional Paper 96 1976. 28 p, 4 fig, 4 tab, 46 ref

Descriptors: *Land classification, *Land us *Remote sensing, Federal government, Sta governments, Data collections, Aerial photo raphy, Aircraft, Satellites(Artificial), Lan development, Urbanization, Agriculture, Forest Wetlands, Tundra, Water, Ranges, Arid land Snow, Ice
Identifiers: *Land cover classification

The framework of a national land use and la cover classification system is presented for u with remote sensor data. The classification syste has been developed to meet the needs of Fede and State agencies for an up-to-date overview land use and land cover throughout the count that will be receptive to data from satellite and a craft remote sensors. The proposed system us the features of existing widely used classificati systems that are amenable to data derived fr remote sensing sources. It is intentionally f open-ended so that Federal, regional, State, a local agencies can have flexibility in develop more detailed land use classification. Revision the land use classification system as presented U. S. Geological Survey Circular 671 was u dertaken in order to incorporate the results of tensive testing and review of the categorizat and definitions. (Woodard-USGS)
W76-11679

SOIL SLIPS, DEBRIS FLOWS, AND RA STORMS IN THE SANTA MONICA MOU TAINS AND VICINITY, SOUTHERN CALIFO NIA,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2E.
W76-11680

SEEPAGE STUDY OF THE ROCKY POI CANAL AND THE GREY MOUNTA PLEASANT VALLEY CANAL SYSTE DUCHESNE COUNTY, UTAH,
Geological Survey, Salt Lake City, Utah.
R. W. Cruff, and J. W. Hood.
Utah Department of Natural Resources, Salt La City, Technical Publication No 50, 1976. 53 p fig, 4 plates, 5 tab, 3 ref.

Descriptors: *Canal seepage, *Water loss, *R systems, Hydrology, *Utah, Data collecti Stage-discharge relations, Hydrologic data.
Identifiers: Duchesne County(Utah), Rocky P canal system, Grey Mountain-Pleasant Va canal system.

A study of the gains or losses of the Rocky P Canal System and the Grey Mountain-Plea Valley canal system, Duchesne County, Utah, made to aid in the water allocation of the c systems. Four sets of seepage runs were m along each of the canals from May 1972 to 1973. Adjustments for fluctuations in flow in canals were made from information obtained water-stage recorders operated at selected tions along the canal during the time of seepage run and from a time-of-travel s Although significant gains and losses were f for specific reaches of the canals, the net los the Rocky Point Canal system, which is 96,8 in length, amounted to 3.4 cubic feet per se (cfs) or about 6 percent of the capacity o canal. The net loss for the Grey Mountain-Ple Valley Canal system, which is 160,300 ft in le was 24.5 cfs or about 8 percent of the c capacity. Qualitative evaluation of the geohyd gy of the study area indicates an estimated r of canal loss to the river system of about 2 cent, or 5.6 cfs. (Woodard-USGS)
W76-11682

INDEX OF CURRENT WATER RESOURCES PROJECTS AND DATA COLLECTION ACTIVITIES IN OHIO, WATER YEAR 1976,
Geological Survey, Columbus, Ohio.
For primary bibliographic entry see Field 7C.
W76-11685

SIMULATED EFFECTS OF THE PROPOSED NARROWS RESERVOIR ON THE WATER-TABLE AQUIFER ALONG THE SOUTH PLATTE RIVER, MORGAN COUNTY, COLORADO,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 4B.
W76-11687

EARLY DETECTION AND CORRECTION OF SINKHOLE PROBLEMS IN ALABAMA, WITH A PRELIMINARY EVALUATION OF REMOTE SENSING APPLICATIONS,
Geological Survey, Tuscaloosa, Ala.
For primary bibliographic entry see Field 7B.
W76-11688

EFFECT OF ATMOSPHERIC STABILITY ON WATER TEMPERATURE PREDICTIONS FOR A THERMALLY LOADED STREAM,
Pennsylvania State Univ., University Park. School of Forest.
For primary bibliographic entry see Field 5B.
W76-11690

ON THE JOINT DISTRIBUTION OF THE LARGEST FLOOD AND ITS TIME OF OCCURRENCE,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 2E.
W76-11694

TRADE-OFF BETWEEN MODELS AND INFORMATION IN RIVER BASIN PLANNING,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources; and Arizona Univ., Tucson. Dept. of Systems and Industrial Engineering.
L. Duckstein.
In: Symposium on the Hydrologic Systems Aspects of Water Resources Planning - Water Resources Problems - Hydrologic Analysis in Perspective, Fall annual meeting of the American Geophysical Union, December, 1974, San Francisco, California, 20 p. 1 fig, 34 ref, append. OWRT B-043-ARIZ(3).

Descriptors: *Planning, *Coordination, *Data collections, *Model studies, *Decision making, Water resources development, River basin development, Evaluation, Input-output analysis, Systems analysis, Operations research, Performance, Resources.

Water resources development usually requires at least 3 groups of people: one group gathers data, one conceives models, and the third makes decisions. Ideally, these 3 groups should work together, but it often happens that they work in a compartmentalized manner. This paper presents a 4-step methodology for problem definition which leads to a logical interconnection between decisions, models, and data. Step 1 defines input-output; the input set consists of elements such as rainfall, floods, pollution, etc., while output involves elements that can be controlled, such as power production or water quantity or quality. In step 2, performance variables, indices, and ordering are defined. Step 3 examines resource indices and ordering for design implementation; the type and quantity of resources to be utilized by a given system are evaluated. The fourth step is designed for the case when conflicts arise between ordering (or performance ranking) of two different systems, which leads to a trade-off ordering. The fifth step is a test plan describing how a system will be evaluated in space and time. (Robinett-Arizona)
W76-11702

FLOOD CONTROL DESIGN WITH LIMITED DATA - A COMPARISON OF THE CLASSICAL AND BAYESIAN APPROACHES,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
E. F. Wood.
In: Design of Water Resources Projects with Inadequate Data, Vol. 1, Proceedings of the Madrid Symposium, June 1973; Unesco - WMO - IAHS, Unesco - OMM - AISH, 1974, p 469-483. 2 fig, 1 tab, 19 ref. OWRT C-4118(9021)(13).

Descriptors: *Flood control, *Design, *Probability, Water resources, Planning, Decision making, Hydrology, Economics, Rivers, Streamflow, Methodology, Costs, Damages, Equations, Mathematical models, Systems analysis.
Identifiers: *Bayesian analysis, Classical approach, Limited data.

Water resource planners usually design flood control structures by choosing an extreme value model. The model's parameters are estimated from the available streamflow data and design decisions are made by finding the discharge related to a particular level of risk. In most design problems, the data on extreme events is severely limited, making parameter estimation difficult. Two different parameter estimation approaches are investigated--classical and Bayesian--which are applied to a flood design problem for a northeastern U.S. river. The classical approach uses the maximum liklihood criterion for parameter estimation. The Bayesian approach is performed for objective prior information based upon observations from other rivers and for subjective prior information derived by considering the effect of river basin development upon flood discharges. The results indicate that the classical and Bayesian approaches lead to different design discharges for the same level of risk. (Bell-COrnell)
W76-11703

A METHODOLOGY FOR EVALUATING DEVELOPMENT-ENVIRONMENTAL CONFLICTS ON WILD AND SCENIC RIVERS,
Idaho Univ., Moscow. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6G.
W76-11707

RESERVOIR EFFECTS ON PROPERTY VALUES ACCORDING TO LOCATION AND RURAL VS. URBAN USE,
Kentucky State Univ., Frankfort. School of Public Affairs.
C. M. Vaughan, and D. M. Soule.
Water Resources Bulletin, Vol. 11, No. 6, p 1103-1106, December 1975. 2 tab, 5 ref. OWRT A-006-KY(15).

Descriptors: *Reservoirs, Effects, *Water resources development, *Economic impact, *Property values, Market value, Lakes, Flooding, *Kentucky.
Identifiers: Urban, Rural, Covariance analysis, Analysis of variance, Lake Cumberland(Kentucky).

Economic impact of water resources development may be hidden by improper grouping of relevant data, as demonstrated in two studies of real property value changes in the same reservoir area and similar time periods. Using market values for the period 1955-65, changes in total value of real property in a 12-county group in the Lake Cumberland, Kentucky area were not significantly different from value changes in five other 12-county groups selected without reference to water resource development. But significant differences were discovered in the period 1950-64 with smaller groups of counties studied according to rural or urban property and location relative to the lake. Covariance analysis of annual property values regressed on time showed that, for rural property, greatest value increases were in the shoreline group, whereas for urban property, greatest value increases were in the shoreline group, whereas for urban property, greatest value increases were in the flood-protected group. These two studies are briefly described and their results are interpreted. (Bell-Cornell)
W76-11708

DEVELOPMENT OF AN AIRBORNE LASER BATHYMETER,
National Aeronautics and Space Administration, Wallops Island, Va. Wallops Flight Center.
For primary bibliographic entry see Field 7B.
W76-11755

PRACTICAL APPLICATIONS OF SPACE SYSTEMS.
National Research Council, Washington, D. C. Space Applications Board.
National Academy of Sciences, Washington, D. C., 1975. 67 p, 2 append. NASA NSR 09-012-016.

Descriptors: *Remote sensing, *Satellites(Artificial), Weather, Climates, Land use, Planning, Agriculture, Forests, Ranges, Surface waters, Lakes, Water resources, Natural resources, Oceans, Water quality, Communication.
Identifiers: *Space Shuttle system.

In November 1973, the National Aeronautics and Space Administration (NASA) asked the National Academy of Engineering to conduct a summer study of future applications of space systems, with particular emphasis on practical approaches, taking into consideration socioeconomic benefits. In December 1973, the Academy agreed to perform the study and assigned the task to the Space Applications Board (SAB). A representative group of users and potential users conducted an intensive two-week study to define user needs that might be met by information or services derived from earth-orbiting satellites. This work was done in July 1974 at Snowmass, Colorado. Subsequently, the SAB reviewed the work of this group, evaluated its findings, and prepared this report, which presents the SAB's own conclusions and recommendations. For the study, user-oriented panels were formed, comprised of present or potential public and private users, including businessmen, state and local government officials, resource managers, and other decision-makers. A number of scientists and technologists also participated, functioning essentially as expert consultants. The conclusions of the study were founded on the resulting statements of needs, as expressed by the user community, in light of considerations of practicability provided by space technologists. The study was designed to provide an opportunity for knowledgeable and experienced users, expert in their fields, to express their needs for information or services which might (or might not) be met by space systems, and to relate the present and potential capabilities of space systems to their needs. (See also W76-11257 thru W76-11760) (Sims - ISWS)
W76-11756

PRACTICAL APPLICATIONS OF SPACE SYSTEMS, SUPPORTING PAPER 3, LAND USE PLANNING.
National Research Council, Washington, D. C. Panel on Land Use Planning.
National Academy of Sciences, Washington, D. C., 1975. 55 p, 3 fig, 3 tab, 1 append. NASA NSR 09-012-106.

Descriptors: *Remote sensing, *Satellites(Artificial), *Land use, *Planning, Aerial photography, Surveys, Mapping, Land classification, Land development, Land resources, Land

management, Forests, Urbanization, Economics, Resources, Conservation.
Identifiers: *ERTS, *Space Shuttle system.

In November 1973, the National Aeronautics and Space Administration (NASA) asked the National Academy of Engineering to conduct a summer study of future applications of space systems, with particular emphasis on practical approaches, taking into consideration socioeconomic benefits. In December 1973, the Academy agreed to perform the study and assigned the task to the Space Applications Board (SAB). For the study, nine user-oriented panels were formed, comprised of present or potential public and private users, including businessmen, state and local government officials, resource managers, and other decision-makers. A number of scientists and technologists also participated, functioning essentially as expert consultants. The Panel on Land Use Planning was comprised of persons who have been involved in remote sensing, processing of the data acquired, and actual utilization in the field of remotely sensed information. Thus, the group was multi-disciplinary in terms of the technology involved, the application of such technology, and the perception of the future utilization of remote sensing in land use planning. (See also W76-11756) (Sims - ISWS)
W76-11757

PRACTICAL APPLICATIONS OF SPACE SYSTEMS, SUPPORTING PAPER 5, INLAND WATER RESOURCES.
National Research Council, Washington, D. C. Panel on Inland Water Resources.
National Academy of Sciences, Washington, D. C., 1975. 77 p, 3 tab, 21 ref, 3 append. NASA NSR 09-012-106.

Descriptors: *Remote sensing, *Satellites(Artificial), *Lakes, *Surface waters, Rivers, Bodies of water, Estuaries, Mapping, Planning, Water resources, Surveys, Floods, Soil moisture, Turbidity, Water pollution, Suspended solids, Snow, Ice, Ice cover, Snow cover, Groundwater resources, Salinity, Runoff.
Identifiers: *Inland waters.

In November 1973, the National Aeronautics and Space Administration (NASA) asked the National Academy of Engineering to conduct a summer study of future applications of space systems, with particular emphasis on practical approaches, taking into consideration socioeconomic benefits. In December 1973, the Academy agreed to perform the study and assigned the task to the Space Applications Board (SAB). For the study, nine user-oriented panels were formed, comprised of present or potential public and private users, including businessmen, state and local government officials, resource managers, and other decision-makers. A number of scientists and technologists also participated, functioning essentially as expert consultants. The primary objective of the Panel on Inland Water Resources was established as determining how and to what extent space technology can be used in the timely development and improved management of the nation's inland water resources. The term 'space technology' refers to a system or systems which may include satellites, high-altitude aircraft, and ground installations with attendant sensors that remotely measure various parameters and collect ground-based data and relay them via satellite to processing centers. Emphasis has been placed on user applications which the panel believes will arise within the next decade. (See also W76-11756) (Sims - ISWS)
W76-11758

PRACTICAL APPLICATIONS OF SPACE SYSTEMS, SUPPORTING PAPER 6, EXTRACTABLE RESOURCES.
National Research Council, Washington, D. C. Panel on Extractable Resources.
National Academy of Sciences, Washington, D. C., 1975. 22 p, 2 fig. NASA NSR 09-012-106.

Descriptors: *Remote sensing, *Satellites(Artificial), *Natural resources, *Land resources, Industries, Mineral industry, Mining, Fuels, Fossil fuels, Coals, Oil, Earth materials, Construction materials, Surveys, Mapping, Geology, Geologic mapping.
Identifiers: *Extractive resources, Extractive industries.

In November 1973, the National Aeronautics and Space Administration (NASA) asked the National Academy of Engineering to conduct a summer study of future applications of space systems, with particular emphasis on practical approaches, taking into consideration socioeconomic benefits. In December 1973, the Academy agreed to perform the study and assigned the task to the Space Applications Board (SAB). For the study, nine user-oriented panels were formed, comprised of present or potential public and private users, including businessmen, state and local government officials, resource managers, and other decision-makers. A number of scientists and technologists also participated, functioning essentially as expert consultants. The Panel on Extractable Resources was charged with reviewing the use of information from space systems in the operation of the extractive industries, particularly in exploration for mineral and fuel resources. The conclusions and recommendations presented were based on the premise that the survival of modern industrial society requires a continuing, secure flow of resources for energy, construction and manufacturing, and for use as plant foods. Discovery of the volumes and qualities of the great variety of earth resources needed to sustain this flow will tax the scientific and engineering ingenuity of industry and government. Data from space systems will provide an important addition to information generated from aircraft-mounted sensors and ground field studies. (See also W76-11756) (Sims - ISWS)
W76-11759

PRACTICAL APPLICATIONS OF SPACE SYSTEMS, SUPPORTING PAPER 7, ENVIRONMENTAL QUALITY.
National Research Council, Washington, D. C. Panel on Environmental Quality.
National Academy of Sciences, Washington, D. C., 1975. 56 p, 1 fig, 9 tab, 3 append. NASA NSR 09-012-106.

Descriptors: *Remote sensing, *Satellites(Artificial), *Environment, Environmental control, Water quality, Air pollution, Water pollution, Industries, Pollutants, Turbidity, Coasts, Oceans, Wetlands, Land use, Public health, Measurement, Sampling, Surveys, Costs, Cost-benefit analysis.

In November 1973, the National Aeronautics and Space Administration (NASA) asked the National Academy of Engineering to conduct a summer study of future applications of space systems, with particular emphasis on practical approaches, taking into consideration socioeconomic benefits. In December 1973, the Academy agreed to perform the study and assigned the task to the Space Applications Board (SAB). For the study, nine user-oriented panels were formed, comprised of present or potential public and private users, including businessmen, state and local government officials, resource managers, and other decision-makers. A number of scientists and technologists also participated, functioning essentially as expert consultants. The Panel on Environmental Quality concerned itself with the potential use of space systems to assist in determining the current state of air, water, and land environments and in monitoring them for the effects of man's activities. The panel elected to narrow its considerations to ways in which space systems might be used to determine: (1) what pollutants are introduced into the major environmental media, (2) what effects of these pollutants are manifested, and (3) the effectiveness of abatement and control actions. Environmental aspects were discussed in relation to: (1) air quality, (2) water quality, (3) land quality as related to land use, and (4) public health. (See also W76-11756) (Sims - ISWS)
W76-11760

UD METHOD OF RESERVOIR FLOOD ROUTING.
Soil Conservation Service, Washington, D.C. Engineering Div.
For primary bibliographic entry see Field 8B.
W76-11761

WATER DRAINAGE FROM HIGHWAY FILLS,
Kansas State Highway Commission, Topeka. Planning and Development Dept.
For primary bibliographic entry see Field 8D.
W76-11762

POTENTIAL PUMPED STORAGE PROJECTS IN THE PACIFIC SOUTHWEST.
Federal Power Commission, Washington, D.C. Bureau of Power.
For primary bibliographic entry see Field 8C.
W76-11764

ENGINEERING USES OF EROS,
Washington Univ., Seattle. Dept. of Electrical Engineering.
For primary bibliographic entry see Field 7B.
W76-11765

EVAPOTRANSPIRATION FROM A SHORT GRASS PRAIRIE SUBJECTED TO WATER AND NITROGEN TREATMENTS,
Colorado State Univ., Fort Collins. Natural Resource Ecology Lab.
For primary bibliographic entry see Field 2D.
W76-11849

ROUGHNESS EFFECTS ON RECTANGULAR FREE OVERFALL,
Alberta Univ., Edmonton. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W76-11855

PEAK FLOW INTER-ARRIVAL TIMES,
Bristol Univ. (England). Dept. of Geography.
For primary bibliographic entry see Field 2A.
W76-11859

WATER RESOURCES AND THEIR DEVELOPMENT IN NIGERIA,
Ibadan Univ. (Nigeria), Dept. of Geography.
J. O. Ayoade.
Hydrological Sciences Bulletin, Vol. 20, No. 4, 581-591, December 1975. 6 fig, 2 tab, 12 ref.

Descriptors: Water resources, *Subsurface waters, *Surface waters, *Groundwater, *Africa, *Groundwater resources, *Hydrogeology, *Water resources development, Hydrology, Drought, Hydrologic cycle, Geology, Evapotranspiration, Seasonal.
Identifiers: *Nigeria, *Thornthwaite's formula.

A preliminary assessment is given of Nigeria's surface and underground water resources. It discussed the relevant meteorological, hydrological and hydrogeological factors which determine the magnitude and spatial pattern of the distribution of these resources. It was pointed out that the present uncoordinated and piecemeal development of Nigeria's water resources stems from the of a national water policy and an adequate institutional framework for managing these resources. Two solutions were suggested. One is that the Federal Government should as a matter of urgency establish a National Water Resources B

charged with rational planning, management and development of the country's water resources. The other is that a training program should be established to produce the necessary skilled manpower in the field of water resources. (Terstriep - ISWS)
W76-11860

AN ANALYSIS OF WATER FLOW IN DRY SNOW,
Cold Regions Research and Engineering Lab., Hanover, N. H.
For primary bibliographic entry see Field 2C.
W76-11865

ANALYSIS OF HYDROLOGIC RESPONSE TO RAIN-ON-SNOW,
Cold Regions Research and Engineering Lab., Hanover, N. H.
or primary bibliographic entry see Field 2C.
/76-11866

EVELOPMENT OF THE UNIVERSITY OF AWAII-MANOA STREAM GAGING STA-ION,
awaii Univ., Honolulu. Water Resources esearch Center.
. S. Fok, and R. H. F. Young.
vailable from the National Technical Informa-n Service, Springfield, Va 22161, as PB-257 061, .50 in paper copy, $3.00 in microfiche. Technical emorandum Report No. 48, May 1976. 18 p, 9 , 3 tab, 3 ref. OWRT A-056-HI(1). 14-31-0001-11.

escriptors: *Streamflow, *Runoff, Urban drology, Hawaii, *Gaging stations, *Stream ges, Water quality, Measurement, Stage-charge relations, Instrumentation, Data collec-ns.
entifiers: *Manoa Valley watershed(HI), hu(HI).

noa Stream drains the Manoa Valley watershed ated near the central part of the Honolulu tropolitan area. Past studies have characterized streamflow, sediment, and water quality of noa Stream. However, the two existing stream-w gaging stations on the stream are located near head of the valley and none in the downstream tion. Hence, there is no good way to correlate discharge at these gages with the discharge in downstream sections of the stream. In this ly, a permanent stream gaging station was blished at a downstream location on the versity of Hawaii campus. The development, rumentation, method of operation, and main-nce of this gaging station are reported. Data ined from this new University of Hawaii-noa Stream Gaging Station will allow meaning-measurements of streamflow and water quality racteristics of Manoa Stream.
-11876

E FUTURE OF THE SAVANNAH RIVER, OCEEDINGS OF A SYMPOSIUM.
nson Univ., S.C. Water Resources Research

ilable from NTIS, Springfield, VA 22161, as 57 059, $7.75 in paper copy, $3.00 in ofiche. Held at Hickory Knob State Park, Mc-nick, SC, by the Water Resources Research , Clemson Univ., in cooperation with En-mental Resources Center, GA Inst. of Tech., Inst. of Ecology, Univ. of Ga. Oct 14-15, 1975, . B. L. Dillman and J. M. Stepp, Editors. RT A-999-SC(6).

riptors: *Future planning, *River basin lopment, Water quality, Electric power, eation, Sediments, Natural resources, Histo-South Carolina, *Georgia, Rivers.
ifiers: *Savannah River(SC-Geo).

These proceedings include the major papers and invited discussions presented at the symposium. Major topics include: (1) Historical perspective; (2) Water quality planning and management; (3) Electric power; (4) Recreation; (5) Sediment problems; (6) Environmental resources; and (7) The Corps of Engineers' role. The general format is one of a major presentation followed by two prepared discussions. (Ligon-Clemson University)
W76-11877

ECOSYSTEM MODELING OF WATER-HYACINTH MANAGEMENT IN LAKE ALICE, FLORIDA,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
For primary bibliographic entry see Field 5G.
W76-11884

SYSTEMS APPROACH FOR THE PLANNING AND MANAGEMENT OF THE MORAVA RIVER BASIN, YUGOSLAVIA,
California Univ., Los Angeles. Dept. of Civil Engineering.
J. A. Dracup, and A. D. Feldman.
Working Paper No. 62, UNDP/UN Interregional Seminar on River Basin and Interbasin Development, Budapest, Hungary, September 1975. 20 p, 3 fig, 3 tab, 4 ref. (United Nations, Department of Economic and Social Affairs).

Descriptors: *Water resources development, *Comprehensive planning, *Computer models, *Project planning, *River basins, Simulation analysis, Optimization, Mathematical models, Systems analysis, Decision making, Feasibility, Hydrologic aspects.
Identifiers: *Morava River basin(Yugoslavia).

The development of a comprehensive master plan for a large-scale water resource system is enhanced by the use of computer based mathematical models for system simulation and optimization. The ultimate use of these hydraulic, hydrologic and water quality models is the formulation of decision and control strategies for the development of an on-line data management and control system for the entire basin. Presented is a case study of the Morava River basin, Yugoslavia, one of several ongoing studies of the Morava by a number of local, federal and international agencies. The Morava River currently requires viable development schemes to alleviate problems of flooding, sedimentation, water supply and water quality. A system description is given, and project objectives and the project plan are discussed. Presented is a comprehensive table of the origin and purpose of models for the Morava River basin; 22 models are considered. Finally, the paper discusses accomplishments to date, including data management, model development and application, and decision and control strategies. (Bell-Cornell)
W76-11886

APPROPRIATION BY THE STATE OF MINIMUM FLOWS IN NEW MEXICO STREAMS,
J. B. Draper.
Natural Resources Journal, Vol 15, p 809-822 (October 1975). 14 p, 70 ref.

Descriptors: *Water allocation(Policy), *New Mexico, *Streams, *Appropriation, *State jurisdiction, Constitutional law, Water law, Water rights, Water resources, Legal aspects, Legal review, Conservation, Headwaters, Wildlife, Prior appropriation, Legislation, State governments.

There are alternatives to prior appropriation, especially where protection of instream values is required. First, the state could withdraw waters from eligibility for appropriation. In New Mexico, a pure appropriation state, this would require a constitutional amendment; but the state engineer could deny new applications and restrict changes in use that reduce return flows. Second, the best method is for the state itself to appropriate waters for instream protection. Legislation should be enacted that would state minimum flows necessary to sustain the riparian habitat and other comparable recreation uses. This method has no constitutional bar to its application. Third, any person, club, or agency could appropriate instream flows, with the beneficial use requirement satisfied by the existence of a recreational purpose. (Frank-Florida)
W76-11899

MINIMUM STREAMFLOW-FEDERAL POWER TO SECURE,
D. A. Grady.
Natural Resources Journal, Vol 15, p 799-807 (October 1975). 9 p, 74 ref.

Descriptors: *Water resources development, *Protection, *Federal jurisdiction, *Headwaters, *Appropriation, Judicial decisions, Water law, Legal aspects, Water resources, Conservation, Wildlife, Wildlife conservation, Navigable waters, Constitutional law, Water rights, Water allocation(Policy), Federal government.

Developers have been appropriating waters recently even up to the headwaters of streams. The result has been a diminution of flow and damage to surrounding wildlife. The federal government has, therefore, been asserting prior rights to instream flows to protect wildlife. Two methods have been used. First, courts have recognized that there is a federal pre-emptive right to all water necessary to fulfill federal land purposes. Headwaters can be protected as being necessary for the support of national forests and parks. Second, the broad federal navigational power can be used as a means to require minimum streamflow. There must only be an incidental navigational purpose for courts to find effective water rights to be lodged in the federal government. (Frank-Florida)
W76-11900

PUBLIC PARTICIPATION IN WATER RESOURCES DEVELOPMENT, A BIBLIOGRAPHY.
Office of Water Research and Technology, Washington, D.C.
For primary bibliographic entry see Field 6B.
W76-11903

BIOLOGICAL CONTROL OF WATER WEEDS WITH PLANT PATHOGENS,
Florida Univ., Gainesville. Dept. of Plant Pathology.
T. E. Freeman, R. Charudattan, K. E. Conway, F. W. Zettler, and R. D. Martyn.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-257 172, $4.00 in paper copy, $3.00 in microfiche. Florida Water Resources Research Center, Gainesville, Publication No. 36, June 1976. 39 p, 2 plates, 4 tab, 42 ref. OWRT A-027-FLA(10). 14-34-0001-6010.

Descriptors: *Biocontrol, *Plant pathology, *Aquatic weed control, *Pathogenic fungi, Rusts, Aquatic insects, Water hyacinth, Biomass, Plant diseases, *Florida.
Identifiers: *Cercospora rodmanii, Rhizoctonia solani, Acremonium zonatum, Uredeo eichhorniae, Bipolaris stenospila, Water hyacinth rust, *Rodman Reservoir(Fla).

Both endemic and exotic plant pathogens were evaluated as biological control agents for water weeds. Additional studies investigated the potential use of an integrated program of biological control using plant pathogens and insects. Of the endemic pathogens tested, Rhizoctonia solani, Acremonium zonatum and Cercospora rodmanii exhibited potential as biocontrols. The latter fungus was the most promising. In fact, C. rodmanii

was established as the causal agent of a decline disease which effectively controlled waterhyacinths in Rodman Reservoir in two out of the last five years. It has the additional advantage of being highly host specific for waterhyacinths. The two exotic pathogens showing the most potential were the waterhyacinth rust, Uredeo eichhorniae and Bipolaris stenospila. Results of the integrated control studies showed that the action of a combination of pathogens and insects would significantly reduce biomass accumulation in waterhyacinth populations. (Morgan-Florida)
W76-11904

TIME OF CONCENTRATION OF OVERLAND FLOW,
Nevada Univ., Reno. Center for Water Resources; and Nevada Univ., Reno. Desert Research Inst.
For primary bibliographic entry see Field 2E.
W76-11958

RELATIONS BETWEEN PROJECT ECONOMICS AND HYDROLOGICAL DATA,
Economic Commission for Europe(UN), New York.
For primary bibliographic entry see Field 6B.
W76-11970

OPTIMIZATION OF WATER RESOURCES DEVELOPMENT PROJECTS IN CASE OF INADEQUATE HYDROLOGIC DATA,
Research Inst. for Water Resources Development, Budapest (Hungary).
For primary bibliographic entry see Field 6A.
W76-11971

WATER ALLOCATION IN UTAH--PROTECTION OF INSTREAM USES,
R. A. Kimsey.
Utah Law Review, Vol 1975, p 687-707 (Fall 1975). 21 p, 112 ref.

Descriptors: *Utah, *Appropriation, *Public benefits, *Water shortage, *Water supply, State governments, Legal aspects, Water users, Water utilization, Economic efficiency, Economics, Priorities, Prior appropriation, Riparian rights.

The appropriative water system in Utah has evolved into a market system because water resources are fully appropriated. In Utah, water goes to the most economically profitable user when it does change hands. This emphasis on market value has in the past left instream users empty-handed because their utility in dollar terms was and still is low. This conflict between water for public benefit and water for private economic development is slowly evolving into a balance between the two. The author sees needed legislative changes taking place, but believes they are inadequate in themselves. The judiciary must ensure an equal voice for instream water uses. This can be done most effectively through the public trust doctrine. All competing values could then be considered, not solely the market value of appropriated waterland. (Frank-Florida)
W76-11974

WETLAND'S RELUCTANT CHAMPION: THE CORPS TAKES A FRESH LOOK AT 'NAVIGABLE WATERS',
Lewis and Clark Coll., Portland, Oreg. Northwestern School of Law.
R. W. Haines.
Environmental Law, Vol 6, p 217-241 (Fall 1975). 25 p, 101 ref.

Descriptors: *Federal Water Pollution Control Act, *Navigable waters, *Wetlands, *Federal jurisdiction, *Rivers and Harbors Act, Estuaries, Marshes, Streams, Headwaters, Lakes, Tributaries, Environment, Environmental control, Conservation, Judicial decisions.

With the passage of the Federal Water Pollution Act Amendments of 1972 (FWPCA), the Corps of Engineers received a mandate to supervise a much broader area of 'navigable waters'. This definition was greatly expanded over the previous one in the 1899 Rivers and Harbors Act. The Corps balked at implementing new regulations, but was forced judicially to do so. The new permit system and regulations were implemented only after a fight with the Environmental Protection Agency over greater protection for wetlands. The discharge of dredge and fill is now covered in primary tributaries as well as natural lakes. In addition, by July 1, 1977 the Corps' jurisdiction will be extended up to the headwaters of all streams and tributaries. (Frank-Florida)
W76-11976

INTERSTATE WATER COMPACTS AND MINERAL DEVELOPMENT,
Loble, Picotte and Pauly, Helena, Mont.
For primary bibliographic entry see Field 3E.
W76-11977

THE INTRACOASTAL WATERWAY: AN ECOLOGICAL PERSPECTIVE,
Florida Atlantic Univ., Boca Raton. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5G.
W76-11986

ALASKA NATIONAL INTEREST LANDS.
For primary bibliographic entry see Field 6E.
W76-11995

WATER RESOURCES PLANNING ACT--OVERSIGHT.
For primary bibliographic entry see Field 6E.
W76-11998

WATER MANAGEMENT DURING DROUGHT EVENTS,
Central and Southern Florida Flood Control District, West Palm Beach.
W. V. Storch.
In Depth Report, Vol 2, No 1, p 1-8, April 1974. 8 p, 2 fig.

Descriptors: *Water allocation(Policy), *Droughts, *Florida, Water resources, *Groundwater, Water levels, Water level recorders, *Water management(Applied), Water table, Water supply, Water utilization, Legislation, Aquifers, Water conservation, Water circulation.
Identifiers: *Lake Okeechobee(Fla).

Drought can begin a long time before people feel its effects, since groundwater levels drop before any crisis appears at the surface. Emergency measures with regard to drought should take the form of supply and demand charts, both for surface and groundwater. Once the water manager is satisfied that an emergency is not due to mechanical failure or local circumstances, the only answer is to reduce water usage. Different drought indices are given, as well as a chart showing water supply and demand trends for Lake Okeechobee. (Frank-Florida)
W76-12000

EXAMINATION OF WATER MANAGEMENT ALTERNATIVES IN CONSERVATION AREA 2A.
Central and Southern Florida Flood Control District, West Palm Beach.
In Depth Report, Vol 2, No 3, p 1-12, July-August 1974. 12 p, 5 fig, 4 photo.

Descriptors: *Florida, *Flood plains, *Drawdown, *Ecosystems, *Fishkill, *Wading birds, Detritus, Grasses, Trees, Plant physiology, Plant morphology, Environmental effects, Grasslands, Willow trees, Wildlife, Wildlife habitats, Wildlife conservation, Wildlife management, Drainage effects, Vegetation regrowth, *Water management(Applied)

In 1973 a decision was made to drain Conservation Area 2A in Broward and Palm Beach Counties, Florida. The drawdown was an attempt to reverse some changed ecological conditions in the area and to consolidate compact and dry organic detritus. Studies of the effects of the drawdown indicated that ecological changes would be reversible and that flora and fauna could be restored. When the marsh levels receded thousands of wading birds, mostly ibis and heron, returned. The result was a very successful rookery in a neighboring area. An associated incident of the drawdown, however, was a fishkill caused primarily by the organic detritus and by overcrowding in available waters. Future kills can be avoided by starting drawdowns much sooner and effecting them more slowly. Vegetation changes resulting from the drawdown included the return of maidencane and break-rush to the area, disappearance of wet prairie growth, with little immediate effect on sawgrass or woody plant. Projections anticipate return of woody growth and of wildlife such as deer and kite. (Comer-Florida)
W76-12003

THE WORLD'S LARGEST WATER PROJECT,
J. Zmuda.
Popular Science, Vol 201, p 62-65 September 197
4 p, 2 fig, 1 map, 14 photo.

Descriptors: *California, *Water conveyanc *Aqueducts, *Dams, *Water supply developmer Los Angeles Aqueduct, Bodies of water, Cha nels, Flood control, Water control, Hydroelectr plants, Water management(Applied), Project Project planning, Costs, Management, Water p icy, Canals, Water utilization, Multiple purpo reservoirs, Water quality, Recreation facilitie Computers.
Identifiers: *California Aqueduct.

The California Aqueduct and the engineeri structures comprising the Tehachapi crossing a major elements of the California State Water Pr ject. Other new facilities, which will cost approx mately $2.3 billion, will include power plan aqueduct systems, the highest earthfill dam in t country and mammoth pumping plants. The Pr ject hopefully will assure flood control, cle hydroelectric power, recreational sites and i proved fish and wildlife habitats. The Aqued begins in northern California and transports wa by gravity to various pumping plants. A system computer monitoring and control centers at f major field divisions regulates over 600 miles aqueduct canals. All operations are monitored a coordinated by computer. Some of the setba which have been encountered and which will h to be solved include: animals falling into aqueduct; tumbleweeds clogging up trash rac thereby impeding water flow; valve failures; labor disputes. (Hadoulias-Florida)
W76-12023

THE SWALE,
Spessard L. Holland Law Center, Gainesville,
For primary bibliographic entry see Field 6E.
W76-12038

NAVIGABLE WATER, A DEFINITION: BENT OUT OF SHAPE,
Spessard L. Holland Law Center, Gainesville,
For primary bibliographic entry see Field 6E.
W76-12039

WATERS: NUMBERLESS YET MEAGER,
Spessard L. Holland Law Center, Gainesville,
For primary bibliographic entry see Field 6E.
W76-12040

'UBLIC SERVITUDE FOR NAVIGATION ON RTIFICIAL WATERS AND THE COMMERCE LAUSE,
pessard L. Holland Law Center, Gainesville, Fla.
or primary bibliographic entry see Field 6E.
/76-12044

HE TAKING ISSUE, FLOOD PLAIN AND ETLANDS ZONING,
pessard L. Holland Law Center, Gainesville, Fla.
or primary bibliographic entry see Field 6E.
76-12049

EGAL PROBLEMS OF MARINA CONSTRUC-ON AND CHANNEL MARKER INSTALLA-ON IN FLORIDA,
essard L. Holland Law Center, Gainesville, Fla.
r primary bibliographic entry see Field 6E.
76-12052

NDOWNER'S AUTHORITY TO PROTECT OPERTY ABOVE ORDINARY HIGH WATER NE FROM SEASONAL FLOODING,
essard L. Holland Law Center, Gainesville, Fla.
r primary bibliographic entry see Field 6E.
6-12058

OOD CONTROL.
primary bibliographic entry see Field 6E.
6-12060

. Groundwater Management

ING FLOW FROM PRE-PENNSYLVANIA CKS IN THE SOUTHWESTERN PART OF E NAVAJO INDIAN RESERVATION, ZONA,
logical Survey, Cheyenne, Wyo.
primary bibliographic entry see Field 2F.
-11673

PRELIMINARY EVALUATION OF THE EMICAL CHARACTER OF WATER NEAR NORTHWEST SHORE OF TOPAZ LAKE, GLAS COUNTY, NEVADA,
ogical Survey, Carson City, Nev.
primary bibliographic entry see Field 5A.
-11674

RAISAL OF THE WATER RESOURCES OF RLOTTE COUNTY, FLORIDA,
ogical Survey, Tallahassee, Fla.
primary bibliographic entry see Field 4C.
-11676

UND-WATER LEVELS IN SELECTED NS IN THE STATE OF UTAH FROM RUARY-MARCH 1974 TO FEBRUARY-CH 1975,
gical Survey, Salt Lake City, Utah.
rimary bibliographic entry see Field 7C.
11678

UND-WATER QUALITY AT THE SITE OF PROPOSED DEEP-WELL INJECTION EM FOR TREATED WASTEWATER, PALM BEACH, FLORIDA,
gical Survey, Tallahassee, Fla.
imary bibliographic entry see Field 5A.
1681

OLOGIC RECONNAISSANCE OF THE VALLEY DRAINAGE BASIN, MILLARD, ER, AND IRON COUNTIES, UTAH,
gicsl Survey, Salt Lake City, Utah.
tephens.

Utah Department of Natural Resources, Salt Lake City, Technical Publication No 51, 1976. 38 p, 3 fig, 1 plate, 9 tab, 24 ref.

Descriptors: *Groundwater resources, *Aquifer characteristics, *Hydrologic data, *Water quality, *Well data, Hydrogeology, Groundwater movement, Water yield, Groundwater recharge, Springs, Ephemeral streams, *Utah.
Identifiers: *Pine Valley drainage basin(Utah).

The Pine Valley drainage basin is an area of about 730 sq mi in Millard, Beaver, and Iron Counties in southwestern Utah. Total annual precipitation in the basin averages about 410,000 acre-ft. Less than 500 acre-ft of runoff reaches the playa on the lowest part of the valley floor. There is no surface outflow from the basin. Ground-water recharge from precipitation averages about 21,000 acre-ft annually. However, about 3,000 acre-ft of the recharge moves eastward under the topographic divide into the adjacent Wah Wah Valley drainage basin. Many of the 80 known springs in the basin issue from perched zones in extrusive igneous rocks in the Needle Range. Estimated average annual ground-water discharge is about 21,000 acre-ft--650 acre-ft by springs; 940 acre-ft by seepage to streams; 5,500 acre-ft by evapotranspiration; less than 5 acre-ft by pumping from wells; and 14,000 acre-ft (including about 3,000 acre-ft that goes to the Wah Wah Valley drainage basin) that is assumed to be discharged by subsurface outflow to maintain the natural balance between recharge and discharge. All water sampled in the basin was chemically suitable for most existing uses. A list of about 100 Publications of the Utah Department of Natural Resources, Division of Water Rights, is included. (Woodard-USGS)
W76-11683

PRELIMINARY EVALUATION OF THE GROUND-WATER DATA NETWORK IN INDIANA,
Geological Survey, Indianapolis, Ind.
For primary bibliographic entry see Field 7A.
W76-11684

INDEX OF CURRENT WATER RESOURCES PROJECTS AND DATA COLLECTION ACTIVITIES IN OHIO, WATER YEAR 1976,
Geological Survey, Columbus, Ohio.
For primary bibliographic entry see Field 7C.
W76-11685

PROBABLE EFFECTS OF INCREASING PUMPAGE FROM THE SCHOFIELD GROUND-WATER BODY, ISLAND OF OAHU, HAWAII,
Geological Survey, Honolulu, Hawaii.
R. H. Dale, and K. J. Takasaki.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-253 752, $4.00 in paper copy, $3.00 in microfiche. Water-Resources Investigations 76-47, May 1976. 45 p, 14 fig, 4 tab, 18 ref.

Descriptors: *Groundwater resources, *Pumping, *Drawdown, *Projections, *Hawaii, Aquifer characteristics, Hydrogeology, Groundwater recharge, Groundwater potential, Water yield, Hydrologic budget, Hydrologic data.
Identifiers: Oahu(Hawaii), *Schofield groundwater body(HI), Increased pumping effects.

The Schofield water body occurs near the geographic center of the island of Oahu, Hawaii. Ground-water dams maintain a head of 85 meters within the body, in contrast with the heads of 7.3 meters or less in the adjacent basal-water bodies. Under present development, pumpage from the Schofield water body is small as compared to the total flux, and most of the ground water flows over or through the adjacent ground-water dams into the adjacent basal-water bodies. Increasing pumpage from the Schofield ground-water body will cause a reduction in head in the Schofield ground-water body, and a decrease in the ground-water flux to the adjacent basal-water bodies. Recharge to the Schofield water body is estimated at 481 thousand cubic meters per day, and pumpage averages 28 thousand cubic meters per day. The difference, 453 thousand cubic meters, flows to the adjacent basal-water bodies. Of the difference, more than 80 percent flows south to the Pearl Harbor basal-water body. (Woodard-USGS)
W76-11686

SIMULATED EFFECTS OF THE PROPOSED NARROWS RESERVOIR ON THE WATER-TABLE AQUIFER ALONG THE SOUTH PLATTE RIVER, MORGAN COUNTY, COLORADO,
Geological Survey, Denver, Colo.
A. W. Burns, and J. B. Weeks.
Open-file report 76-379, May 1976. 15 p, 7 fig, 2 tab, 6 ref.

Descriptors: *Model studies, *Pre-impoundment, *Water table, *Surface-groundwater relationships, Computer models, Forecasting, Methodology, Reservoirs, Dams.
Identifiers: Morgan County(Colo), Narrow reservoir(Colo), *South Platte River(Colo).

A computer model was used to estimate the effects of the proposed Narrows Reservoir on the alluvial aquifer adjacent to the South Platte River near Fort Morgan, Colo. Changes in ground-water discharge to the river caused by the proposed reservoir were estimated assuming steady-state conditions. The proposed reservoir was simulated for two different reservoir pool altitudes. For the conditions simulated, the principal effects of the proposed reservoir on the ground-water system would be an increase in water-table altitude in the aquifer and a redistribution of ground-water discharge to the South Platte River. The change in water level at Fort Morgan was less than 1 foot for the two reservoir conditions simulated. No significant change in the ground-water system would occur downstream from Fort Morgan. Ground-water discharge would decrease by 24 cubic feet per second (cfs) above the proposed dam and increase by 24 cfs below the proposed dam for steady-state conditions with the reservoir pool at 4,404 feet. Ground-water discharge would decrease by 11 cfs above the proposed dam and increase by 15 cfs below the proposed dam for steady-state conditions with the reservoir pool at 4,383 feet. (Woodard-USGS)
W76-11687

TRANSIENT SIMULATION OF SALTWATER INTRUSION IN SOUTHEASTERN FLORIDA,
Princeton Univ., N. J. Dept. of Civil Engineering; an Princeton Univ., N. J. Water Resources Program.
For primary bibliographic entry see Field 2L.
W76-11689

STATUS REPORT ON HEAT STORAGE WELLS,
General Electric Co., Santa Barbara, Calif. Center for Advanced Studies.
For primary bibliographic entry see Field 5G.
W76-11701

WASTE INJECTION INTO THE HAWAIIAN GHYBEN-HERZBERG AQUIFER: A LABORATORY STUDY USING A SAND-PACKED HYDRAULIC MODEL,
Hawaii Univ., Honolulu. Water Resource Research Center.
For primary bibliographic entry see Field 5B.
W76-11777

MULTIPLE-COMPLETION GEOTHERMAL ENERGY PRODUCTION SYSTEMS,
For primary bibliographic entry see Field 8B.
W76-11828

METHOD OF INHIBITING SCALE FOR HIGH TEMPERATURE STEAM WELLS,
Union Oil Co. of California, Brea. (Assignee).
For primary bibliographic entry see Field 8G.
W76-11842

THE AGE OF GROUNDWATER IN THE CHALK OF THE LONDON BASIN,
Atomic Energy Research Establishment, Harwell (England).
For primary bibliographic entry see Field 2F.
W76-11848

WATER RESOURCES AND THEIR DEVELOPMENT IN NIGERIA,
Ibadan Univ. (Nigeria), Dept. of Geography.
For primary bibliographic entry see Field 4A.
W76-11860

HYDROLOGICAL STUDIES OF THE SAGINAW FORMATION IN THE LANSING, MICHIGAN AREA - 1962,
Michigan State Univ., East Lansing. Dept. of Geology.
For primary bibliographic entry see Field 2F.
W76-11870

FIELD EVALUATION OF A RECHARGE BASIN,
New York State Dept. of Transportation, Albany. Engineering Research and Development Bureau.
R. J. Weaver, and R. A. Kuthy.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-241 532, $3.50 in paper copy, $3.00 in microfiche. Report NYSDOT-ERD-75-RR26, February 1975. 17 p, 7 fig, 3 tab.

Descriptors: *Recharge ponds, *Storm water, *Groundwater recharge, Artificial recharge, Pit recharge, On-site investigations, On-site data collections, Inflow, Storm runoff, Water levels, Highways, Soils, Soil mechanics, Soil properties, Infiltration, Data collections, Data processing, Civil engineering.
Identifiers: *Recharge basin tests.

The results are presented of a full-scale field infiltration test performed on a temporary 150- by 35-ft recharge basin, which was inundated by controlled discharge from a 4.5-million gallon storage tank. The data obtained from the test permitted the verification of a basin design method developed in a previous study. The theory developed in the original study was for a constant-head, suddenly applied case and used a value equal to half the maximum head in determining the infiltration rate. This theory and corresponding assumptions were found to lead to a desirable net safety factor of 1.40, as was originally anticipated. As a result of this work, the Soil Mechanics Bureau of the New York State Department of Transportation is preparing a manual covering both design and environmental considerations in using recharge basins. (Sims-ISWS)
W76-11872

AN ECOLOGICAL MODEL FOR HEAVY METAL CONTAMINATION OF CROPS AND GROUND WATER,
Royal Danish School of Pharmacy, Copenhagen.
For primary bibliographic entry see Field 5B.
W76-11885

UNDERGROUND LIQUID WASTE DISPOSAL,
American Society of Civil Engineers, New York. Task Committee on Underground Liquid Disposal.
For primary bibliographic entry see Field 5E.
W76-11888

EARTH'S HIDDEN ASSET, OUR MOST VALUABLE SOURCE OF WATER IS ALSO THE MOST VULNERABLE,
P. W. Quigg.
Audubon, Vol 78, p 126-132, May 1976. 7 p, 1 dwg.

Descriptors: *Groundwater, *Groundwater availability, *Groundwater basins, *Aquifer systems, Aquifer characteristics, Aquifer management, Base flow, Groundwater recharge, Groundwater resources, Oil-water interfaces, Surface-groundwater relationships, Water table, Water supply, Water wells, Watersheds, Water pollution sources, Water pollution effects, Groundwater mining, Groundwater movement, Land subsidence.

Groundwater has been a primary source of useable water for thousands of years. In some areas of the world underground reservoirs are perhaps the only means of survival. In the United States, however, groundwater is currently endangered. In areas of Texas and New Mexico thousands of feet of groundwater are removed each year with recharge measurable in inch franctions. In southern California most aquifers are already dry. Besides depleting a non-renewable resource, over pumping can cause serious surface damage through subsidence. If groundwater is properly used, however, it is the safest, cheapest, purest water available. In addition to the quantity, purity of groundwater is also endangered. Methods of surface pollution reduction such as underground fuel pipelines, cesspools and septic tanks, buried radioactive wastes, industrial waste pits, injection wells and sanitary landfills all provide dangerous seepage possibilities into groundwater reserves. Since groundwater pollution is difficult detect until too late, action is needed soon to protect groundwater resources for the future. (Comer-Florida)
W76-11895

WISCONSIN STRIVES TO MINIMIZE CONFLICTS OVER THE USE OF WATER,
P. V. McAvoy.
Marquette Law Review, Vol 59, p 145-168 (1976). 24 p, 80 ref.

Descriptors: *History, *Wisconsin, *Water resources, *Groundwater, *Surface water, Judicial decisions, Legal review, Legal aspects, Water resources, Wells, Withdrawal, Water supply, Water table, Water policy, Water allocation(Policy).

Analyzed here is the Wisconsin Supreme Court's record in dealing with groundwater. Two cases are specifically examined, but the broader context covers the development of over 70 years of water law. The court made the shift from the old commonlaw, or English rule, to the more modern American rule, by overruling one of the state's most basic water law cases. The shift was from having complete freedom to draw underground water to withdrawal for a beneficial use. Now it is also possible to sue one who violates this rule at all; previously, no cause of action existed without a showing of malicious intent. This modern view does not indicate a sudden scarcity of water, but rather an acknowledgment that groundwater movement is scientifically predictable. Proof of damage will now be legally acceptable. (Frank-Florida)
W76-11896

DRILLERS STARTED AT THE BOTTOM AND WENT DOWN.
For primary bibliographic entry see Field 8B.
W76-11908

MOST JAMAICAN WATER COMES FROM LIMESTONE AQUIFERS,
National Water Authority of Jamaica (Kingston).
G. Shrivastava.
The Johnson Drillers Journal, Vol. 48, No. 3, p 12-13, May-June, 1976. 1 fig.

Descriptors: *Aquifers, *Limestone, *Karst topography, *Water wells, Permeability, Transmissivity, Model studies, Groundwater
Identifiers: *Jamaica, Well testing, Well siting, Drilling costs.

Limestone aquifers are the major source of water in Jamaica and their importance is increasing continuously with the demand for water for domestic, agricultural and industrial purposes. The land surface of the island is nearly entirely underlain by limestone and is permeated by karst topography. Ground water levels are ephemeral in the limestone aquifers. An instance of an annual variation of 240 feet has been observed. A well yield of 2000 gallons per minute with minimum drawdown is not unusual. The flow in the hard limestone aquifers is due to a combination of pipe flow, open channel flow and flow through a porous medium. Consequently, equations of groundwater hydraulics have limited application. Aquifer models have provided more reasonable aquifer perameters for local ground-water basins. Well siting has been a problem in the hard limestone aquifers. Well acidizing is used to improve yield in wells where blocking of fissures by fine particles is a problem. Freezing of groundwater around a well shows promise of increasing well yields. Due to the great depth of groundwater occurrence and high drilling cost of drilling, the search for methods to improve well yields continue. (Heiss-NWWA)
W76-11910

ENCRUSTATION,
Plummer and McDannald Co., Galena, Ohio.
For primary bibliographic entry see Field 8G.
W76-11912

USING FRACTURE TRACES TO LOCATE WATER WELLS,
National Water Well Association, Worthington, Ohio.
For primary bibliographic entry see Field 8G.
W76-11916

HARRIS-GALVESTON SUBSIDENCE DISTRICT CREATED TO 'END' SUBSIDENCE,
Harris-Galveston Coastal Subsidence District, Houston, Tex.
E. Wagoner.
The Cross Section, Vol. 22, No. 6, p 3-4, June, 1976. 1 fig.

Descriptors: *Land subsidence, *Groundwater, *Water wells, Legislation, Water supply, Hydraulics, Safe yield, Water conservation, Water demand, Surface waters, Well permits, Texas.
Identifiers: *Galveston Coastal Subsidence District.

Land surface subsidence has become a critical problem in some areas of the Texas Gulf Coast area in recent years. During 1974 an average of 2 million gallons of water per day was pumped from an area including all of Galveston county and the eastern half of Harris County. Because of its low elevation, the land in the area of concentrated emphasis is critically affected by subsidence. The Harris-Galveston Coastal Subsidence District was created in 1975 by the 64th Texas Legislature to combat this problem. The plan is to control subsidence within the boundaries of the districts jurisdiction by reduction of ground water withdrawals to amounts which will restore and maintain sufficient artesian pressure to control and prevent subsidence. The District plann recognize surface waters as a viable alternative meeting the increasing water needs of Harris Galveston counties. The three principal sources surface waters available to the area within the District are the Trinity, San Jacinto and Brazos Rivers. A number of water users are using surface water and others are planning to convert to surface water in the future. Additional need of surface water supplies has prompted the construction

Lake Livingston on the Trinity River which will
yield 840 million gallons per day by the end of
1976. Well permits are required for wells already
existing and wells to be drilled. The permits are is-
sued for a term of one to five years. At least once a
year the District makes a complete study of the
ground-water situation to determine water levels,
ates of withdrawal and other information which
nay affect land subsidence within the district.
Heiss-NWWA)
W76-11919

**ISTRIBUTED PARAMETER IDENTIFICA-
ION OF GROUNDWATER SYSTEMS BY NON-
INEAR ESTIMATION,**
niversidad de Los Andes, Merida (Venezuela).
ept. of Systems Engineering.
or primary bibliographic entry see Field 2F.
/76-11957

**ROBLEMS OF GROUNDWATER RIGHTS IN
HIO,**
kron Univ., Ohio. School of Law.
. H. Coogan.
kron Law Review, Vol 9, No 1, p 34-115 (1975).
p, 31 fig, 2 append.

escriptors: *Ohio, *Groundwater, *Judicial deci-
ons, *Riparian rights, Common law, Water pollu-
on control, Water pollution effects, Classifica-
on, Water resources, Legal review, Un-
rground, Groundwater resources, Groundwater
ovement, Underground streams, Water supply,
rface water availability, Trespass, Groundwater
ailability, Groundwater potential.

is article outlines the development and the
tus of the law applicable to groundwater
oblems in Ohio. A summary of the Ohio law and
es dealing with groundwater rights are
esented. Trends, exceptions and critical turning
nts in Ohio groundwater law are noted. Three
es of problem cases are recognized: cases in-
ving interference with groundwater supply;
es involving interference with a surface water
ply through use of groundwater supply; and
es of damage to property through the use of
undwater. In groundwater interference cases
Ohio Supreme Courth has applied the English,
bsolute rule, that groundwater extracted from
's land is part of the freehold and derived from
's ownership of the soil. Even so, some lower
rts have limited the taking of groundwater to
ations where there is no interference with
blished riparian rights and no resulting 'draw
n' of surface streams. Another groundwater
ciple not yet applied in Ohio is that of trespass.
undwater which flows to adjacent lands and
imentally affects its use and value is a
pass. As water becomes more scarce in Ohio,
e will undoubtedly be arguments for the aban-
ment of the strict application of the absolute
(Hadoulias-Florida)
-11980

**IEW OF PROJECTS AFFECTING SOLE
RCE AQUIFERS, EDWARDS UN-
GROUND RESERVOIR, TEXAS AREA; IN-
IM PROJECT REVIEW GUIDELINES.**
ironmental Protection Agency, Washington,

primary bibliographic entry see Field 5G.
-11991

**ER MANAGEMENT DURING DROUGHT
NTS,**
ral and Southern Florida Flood Control Dis-
West Palm Beach.
rimary bibliographic entry see Field 4A.
-12000

**RECYCLE--REUSE, INFALL--OUTFALL, DECI-
SIONS CONFRONT SCIENCE, PUBLIC,**
Central and Southern Florida Flood Control Dis-
trict, West Palm Beach.
For primary bibliographic entry see Field 5D.
W76-12001

**MANAGING SOUTH FLORIDA'S GROUND-
WATER AQUIFER,**
Central and Southern Florida Control District,
West Palm Beach.
W. V. Storch.
In Depth Report, Vol 1, No 3, p 1-12, March 1972.
12 p, 5 fig, 1 tab.

Descriptors: *Aquifers, *Surface-groundwater
relationships, *Florida, *Groundwater,
*Groundwater resources, Water resources, Water
table, Water table aquifers, Droughts, Water
storage, Groundwater movement, Groundwater
potential, Groundwater availability, Subsurface
waters, Surface waters, *Water manage-
ment(Applied).

Maps, tables and charts indicate aquifer
withdrawal patterns throughout the state of
Florida. This information suggests that, barring
extreme drought or increased waste, there will be
sufficient resources of water for the forseeable fu-
ture in Florida. The geologic nature of several dif-
ferent aquifers are discussed, as well as the inti-
mate connection between surface and subsurface
waters. The relationship between fresh and salt-
water is also explored. The use of electronic
analog models, financed by the Federal Govern-
ment, aid in predicting aquifer reaction to surface
weather conditions. (Frank-Florida)
W76-12002

**EXAMINATION OF WATER MANAGEMENT
ALTERNATIVES IN CONSERVATION AREA
2A.**
Central and Southern Florida Flood Control Dis-
trict, West Palm Beach.
For primary bibliographic entry see Field 4A.
W76-12003

**THE UNTAPPED UNDERGROUND SEA OF
PURE WATER,**
R. Gannon.
Popular Science, Vol 204, p 92-94, 150-151, April,
1974. 5 p, 1 map, 1 illus, 5 photo.

Descriptors: *Groundwater recharge,
*Groundwater resources, *Hydrologic cycle,
*Aquifers, *Geological surveys, Groundwater,
Freshwater, Hardness(Water), Water supply,
Water table, Water pollution, Land subsidence,
Saline water intrusion, Surface waters, Water de-
mand, Water wells, Stream-groundwater relation-
ships, Natural recharge, Streamflow, Ground-
water mining, Groundwater availability, Surface
water availability, Water utilization.

Improved techniques for locating, measuring and
keeping track of water are being utilized by the
United States Geological Survey. Although sur-
face water supplies are running low, surface water
is only 4% of the potential freshwater supply.
Presently, 20% of the nation's water needs is filled
from underground reservoirs. Unfortunately,
groundwater is usually hard water because of dis-
solved minerals. It may also be contaminated. The
three methods used successfully to purify polluted
groundwater supplies are containment, reduction
of leachate concentration and retrieval wells.
Another problem pertaining to groundwater oc-
curs when the water table is lowered in areas
where the groundwater recharge rate is lower than
the water removal rate. This lowering of the water
table can cause reduced streamflow since half the
water flowing in streams comes from groundwater
rather than surface runoff. Some regions also ex-
perience problems of land subsidence when the
water table is lowered while coastal areas often
suffer from salt water intrusion. (Capehart-
Florida)
W76-12022

GROUND WATERS.
For primary bibliographic entry see Field 6E.
W76-12062

4C. Effects On Water Of Man's Non-Water Activities

**APPRAISAL OF THE WATER RESOURCES OF
CHARLOTTE COUNTY, FLORIDA,**
Geological Survey, Tallahassee, Fla.
H. Sutcliffe, Jr.
Florida Bureau of Geology, Tallahassee, Report of
Investigations No 78, 1975. 53 p, 18 fig, 13 tab, 24
ref.

Descriptors: *Groundwater resources, *Aquifer
characteristics, *Water quality, *Water demand,
*Urbanization, Hydrologic data, Water levels,
Water yield, Water utilization, Chemical analysis,
Surface-groundwater relationships, Saline water
intrusion.
Identifiers: Charlotte County(Fla).

The coastal area of Charlotte County, in west-cen-
tral Florida, is undergoing rapid urbanization and
is experiencing major problems in obtaining suffi-
cient water of suitable quality to meet public-
supply requirements. The upper artesian aquifer,
or Zone 1, lies 50 to 150 ft below land surface. This
zone is commonly used as a source for domestic
and small irrigation supplies and provides some
water for public supplies. Zone 2 lies 150 to 250 ft
below land surface and is used extensively by ir-
rigators in eastern Charlotte County. Zone 3 lies
250 to 400 ft below land surface. Many unused ir-
rigation wells tapping this zone are being plugged
by land developers to prevent the movement of
saline water (5000 mg/liter of dissolved solids) into
the upper zones. Zone 4 lies 600 to 800 ft below
land surface and water from this zone is more
saline than water from the upper zones. In the
western half of the county, the shallow aquifer has
been intruded by salt water from the Gulf and the
estuaries and from deeper zones. Large water sup-
plies for Charlotte County will be obtained in the
future chiefly from: (1) the water-table aquifer in
the southeastern part where permeable shell beds
yield as much as 600 gpm of potable water; (2)
Zones 1 and 2 where they have not been con-
taminated by saline water; (3) desalted ground
water; and (4) water imported from outside the
county. (Woodard-USGS)
W76-11676

**EARLY DETECTION AND CORRECTION OF
SINKHOLE PROBLEMS IN ALABAMA, WITH
A PRELIMINARY EVALUATION OF REMOTE
SENSING APPLICATIONS,**
Geological Survey, Tuscaloosa, Ala.
For primary bibliographic entry see Field 7B.
W76-11688

**A HYPOTHESIS FOR URBAN RAINFALL
ANOMALIES,**
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 2B.
W76-11744

WATER DRAINAGE FROM HIGHWAY FILLS,
Kansas State Highway Commission, Topeka.
Planning and Development Dept.
For primary bibliographic entry see Field 8D.
W76-11762

EVALUATION OF STREAM CHANNELIZATION AND MITIGATION ON THE FISHERY RESOURCES OF THE ST. REGIS RIVER, MONTANA,
Montana Cooperative Fishery Unit, Bozeman.
J. A. Lund.
Fish and Wildlife Service, Washington, D. C., Office of Biological Services, Report FWS/OBS-76-07, June 1976. 49 p, 12 tab, 14 ref, append. FWS 14-16-0008-737.

Descriptors: Streambeds, Channel morphology, *Fish populations, *Road construction, *Railroads, Trout, *Montana, Rivers, Turbidity, Erosion, Water temperature, Water chemistry, Streams.
Identifiers: *Stream channelization, Stream morphology, Mitigating devices(Fish), *St Regis River(Mont).

Stream morphology and gamefish populations of the St. Regis River, Montana were studied during the summers of 1973, 1974 and 1975 to determine the effects of stream channelization caused by highway (Interstate 90 and U. S. 10) and railroad construction. In-stream structures used to mitigate fish losses were also evaluated. Population estimates were made using electrofishing methods on unaltered, altered, altered with mitigating structures, and 'old' altered study sections. Physical parameters of each section were mapped to show differences between altered and unaltered sections. Results show that mitigating structures (jetties and random rock clusters) were effective in providing fish habitat comparable to unaltered sections. Fish populations in new channels usually stabilized in approximately one year. Trout populations in 'old' altered sections with no mitigation failed to recover to unaltered section levels. Due to aesthetic reasons, fishermen preferred unaltered or partially altered sections over altered sections. The number of pools per section as measured by pool-riffle periodicity provided the closest correlation to trout population changes. (FWS)
W76-11800

FIELD EVALUATION OF A RECHARGE BASIN,
New York State Dept. of Transportation, Albany. Engineering Research and Development Bureau.
For primary bibliographic entry see Field 4B.
W76-11872

HYDROMETEOROLOGY OF HEAVY RAINSTORMS IN CHICAGO AND NORTHEASTERN ILLINOIS, PHASE I - HISTORICAL STUDIES,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 2B.
W76-11875

ATMOSPHERIC SULFUR: ITS EFFECT ON THE CHEMICAL WEATHERING OF NEW ENGLAND,
Dartmouth Coll., Hanover, N.H. Dept. of Earth Sciences.
For primary bibliographic entry see Field 5A.
W76-11890

EFFECTS OF FIRE ON NUTRIENT MOVEMENT IN A SOUTH CAROLINA PINE FOREST,
Du Pont de Nemours (E. I.) and Co., Aiken, S. C. Savannah River Lab.
For primary bibliographic entry see Field 5B.
W76-11933

4D. Watershed Protection

EXPERIENCE WITH LAND APPLICATION OF WASTEWATER AND STATE REGULATIONS - THE PENNYPACK WATERSHED,
Martin (A. W.) Associates, Inc., King of Prussia, Pa.
For primary bibliographic entry see Field 5D
W76-11642

EXPERIENCE WITH LAND APPLICATION OF WASTEWATER AND STATE REGULATIONS - PENNYPACK WATERSHED-PENNSYLVANIA,
Pennypack Watershed Association, Bryn Athyn, Pa.
For primary bibliographic entry see Field 5D
W76-11643

FLOW FROM SMALL WATERSHEDS ADJACENT TO THE STUDY REACH OF THE GILA RIVER PHREATOPHYTE PROJECT, ARIZONA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 2E.
W76-11677

TRAVEL TIMES AND NONLINEARITY OF FLOOD RUNOFF FROM TRACER MEASUREMENT ON A SMALL WATERSHED,
New South Wales Univ., Kensington (Australia), School of Civil Engineering.
For primary bibliographic entry see Field 2E.
W76-11850

SAFETY FACTORS FOR RIPRAP PROTECTION,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W76-11856

A COMPARISON OF PHOSPHORUS AND WATER CONTRIBUTIONS BY SNOWFALL AND RAIN IN NORTHEAST OHIO,
Kent State Univ., Ohio. Dept. of Geology.
For primary bibliographic entry see Field 5B.
W76-11858

DEVELOPMENT OF THE UNIVERSITY OF HAWAII-MANOA STREAM GAGING STATION,
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 4A.
W76-11876

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

EVALUATION OF PFIZER SELECTIVE ENTEROCOCCUS AND KF MEDIA FOR RECOVERY OF FECAL STREPTOCOCCI FROM WATER BY MEMBRANE FILTRATION,
Ontario Ministry of Health, Toronto(Ontario). Lab. Services Branch.
M. H. Brodsky, and D. A. Schiemann.
Applied and Environmental Microbiology, Vol. 31, No. 5, p 695-699, May, 1976. 3 tab, 16 ref.

Descriptors: *Streptococcus, *Sewage effluents, *Membrane processes, *Analytical techniques, Filters, Microbiology, Bacteria, Microorganisms, Hydrolysis, Evaluation, Performance, Efficiencies, *Pollutant identification.
Identifiers: Enterococci, Membrane filtration.

Pfizer selective enterococcus and KF agars were compared for their recovery of fecal streptococci from sewage effluent on membrane filters. The KF agar recovered significantly greater numbers of organisms but was not as selective as the Pfizer agar. About 83% of the typical colonies were confirmed as fecal streptococci and 54% as enterococci with the KF agar, and more than 90% of all colonies recovered on membrane filters were confirmed as fecal streptococci and 86% as enterococci with the Pfizer agar. The tan color resulting from esculin hydrolysis, which was not always visible on the surfaces of the colonies, was not considered a necessary differential characteristic on the Pfizer agar. The detection of esculin hydrolysis on membrane filters was not improved by using a new Millipore type HC filter. An attempt to improve the selectivity of KF agar while retaining its inclusiveness by incubation at 45 C was not successful. (Kreager-FIRL)
W76-11628

MICROMETHODS FOR THE DETERMINATION OF NONFILTERABLE AND FILTERABLE RESIDUES,
Environmental Protection Agency, Chicago, Ill. Central Regional Lab.
M. J. Carter, M. Huston, and O. J. Logsdon II.
Journal Water Pollution Control Federation, Vol. 48, No. 4, p 652-659, April, 1976. 5 tab, 23 ref.

Descriptors: *Gravimetric analysis, *Pollutant identification, *Analytical techniques, Evaluation, Filters, Equipment, Measurement, Filtration, Membrane processes.
Identifiers: Filterable residues.

Micromethods for the gravimetric analysis of nonfilterable and filterable residues in water samples are described and compared with standard methods. An electronic microbalance equipped with digital display units and a polonium-210 ionizing source to reduce the electrostatic charge on the filters is used for both nonfilterable and filterable determinations. Sample filtration is performed with a Millipore thirty-place membrane sampling manifold using 15- by 125 millimeter culture tubes to receive the filtrate. A comparison of the micromethod for both nonfilterable and filterable residue analysis with the corresponding standard methods reveals no significant differences for a variety of water sample types. The precision of the micromethod for nonfilterable residue analysis is 3 mg/liter below 50-mg/liter nonfilterable residue and 9 mg/liter above 50 mg/liter at the 95% confidence level. The precision of the method for filterable residue analysis is 26 mg/liter at the 95% confidence level. (Kreager-FIRL)
W76-11633

THE USE OF CARBON DIOXIDE IN SAMPLING AND PRESERVING NATURAL LEACHATES,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
N. E. Korte, E. E. Niebla, and W. H. Fuller.
Journal Water Pollution Control Federation, Vol. 48, No. 5, p 959-961, May, 1976. 2 fig, 2 tab, 9 ref.

Descriptors: *Leachate, *Sampling, *Preservation, *Carbon dioxide, *Chemical properties, Landfills, *Pollutant identification, Inorganic compounds, Ions, Chemical reactions.

The use of carbon dioxide for preserving natural leachate samples collected for the purpose of assessing the pollution potential of sanitary landfills was investigated. Two sets of natural leachate obtained from a commercial septic tank were collected, one under carbon dioxide and the other exposed to the atmosphere. For the collection and maintanance of samples under carbon dioxide, the collection vessel was first purged with the gas, and the leachate was added while the effluent was being flushed with carbon dioxide. Leachate collected with carbon dioxide did not show precipitation or changes in pH, color, and dissolved inorganic ion concentration which were associated with leachate samples exposed to the atmosphere. Such changes occurred even as a result of momentary contact of the sample with air, indicating the degree of precaution required to preserve neutral leachates. (Kreager-FIRL)
W76-11634

MOST PROBABLE NUMBER VERSUS MEMBRANE FILTER ON CHLORINATED EFFLUENTS,
Rockland County Sewage Treatment Plant, Orangeburg, N. Y.
For primary bibliographic entry see Field 5D.
W76-11635

DETERMINATION OF NITRATE ION AT THE PART PER BILLION LEVEL IN ENVIRONMENTAL SAMPLES WITH A CONTINUOUS FLOW IMMOBILIZED ENZYME REACTION,
Georgia Univ., Athens. Dept. of Chemistry.
D. R. Senn, P. W. Carr, and L. N. Klatt.
Analytical Chemistry, Vol. 48, No. 7, p 954-958, June, 1976. 4 fig, 4 tab, 29 ref.

Descriptors: *Colorimetry, *Enzymes, *Nitrates, Pollutant identification, Analytical techniques, Industrial wastes, Sea water, Effluents, Ions.

An enzymatic procedure for the colorimetric determination of nitrate ion in aqueous samples is described. The mehod is based on the enzymatic reduction of nitrate to nitrite by the radical nitrite of the radical cation of 1,1'-dimethyl-4,4'-bipyridinium dichloride in the presence of the enzyme nitrate reductase. The production of nitrite is monitored by the sulfanilamide N-(1-naphthyl) ethylenediamine dichloride azo dye reaction. A detection limit of 17 ppb is possible using a 1-centimeter cell in a continuous flow analyzer. The detection limit can be increased to about 2 ppb by using a non-flow system since photometer noise is the major limiting factor. Although the procedure utilizes an immobilized enzyme, the method can be adapted for use with soluble enzyme preparations. Analyses of industrial effluent samples revealed good correlation with the accepted copper-cadmium reductor method. The precision of the method is 1% in a continuous flow analyzer at a concentration of 0.2 ppm. The method can also be used for analyzing sea water samples where the nitrate content is typically less than 50 ppb. (Kreager-FIRL)
W76-11636

CONTRIBUTION TO THE STUDY OF STORM WATER IN URBAN ENVIRONMENT
CONTRIBUTION A L'ETUDE DES EAUX DE RUISSELLEMENT EN MILIEU URBAIN),
Joustis, G. Martin, and J. P. Dubreuil.
Techniques et Sciences Municipales--L'Eau, Vol. 71, No. 4, p 179-181, April, 1976. 3 fig, 1 tab, 2 ref.

Descriptors: *Pollutant identification, *Storm water, *Cities, *Drainage water, *Urban drainage, Recreation, Zinc, Copper, Chemical oxygen demand, Lead, Organic compounds, *Storm water, Urban runoff.

A study was made in an urban environment to assess the potential hazards of using drainage water for recreational purposes. Zinc and copper concentrations were low, but significant quantities of lead and hydrocarbons were found. Chemical oxygen demand (COD) is at a maximum after one hour of dry and greater after a long dry spell, but pollution due to storm water remains small. (Snyder-Kreager-FIRL)
W76-11637

EVALUATION OF THE APPLICABILITY OF PYROLYSIS-GAS-LIQUID CHROMATOGRAPHY FOR THE IDENTIFICATION OF MICROORGANISMS IN WATER AND SEWAGE TREATMENT PLANT EFFLUENTS,
National Bureau of Standards, Washington, D. C. Center for Building Technology.
J. Symuleski.
Proceed. 3rd National Conference on Complete Wastewater Reuse, June 27-30, 1976, Cincinnati, Ohio, p 1-11. 2 fig, 1 tab, 29 ref.

Descriptors: *Pollutant identification, *Bacteria, *Waste water treatment, *E. coli, *Chromatography, *Automation, Effluents, Analytical techniques, Coliforms, Microorganisms, Feasibility studies, Evaluation.
Identifiers: *Pyrolysis-gas-liquid chromatography.

A study of pyrolysis-gas-liquid chromatography was performed to determine its feasibility for the automated identification of bacteria in water and waste water treatment effluents. Analysis of chromatograms and integrator tapes from ten runs on Escherichia coli showed a vary high degree of reproducibility, even between samples with weight differences of between 300 and 400 micrograms. The maximum standard deviation in retention time for any one peak occurring early in the trace was plus or minus 0.07 minutes. The highest degree of reproducibility in retention times occurred after peak 16, with the maximum standard deviation being plus or minus 0.04 minutes. The technique appears to have good potential for routine taxonomic work, and the present study indicates that the detection of E. coli can be made at levels that are occasionally encountered in sewage treatment plant effluents. Further work is necessary to determine whether or not the technique is applicable for the analysis of bacteria at concentrations as low as 2-10 colonies/100 ml. (See also W76-11257) (Kreager-FIRL)
W76-11664

EVALUATION OF TOXICITIES AND ENVIRONMENTAL IMPACT IN 'SYMBIOTIC' WATER REUSE SYSTEMS,
For primary bibliographic entry see Field 5D.
W76-11665

A PRELIMINARY EVALUATION OF THE CHEMICAL CHARACTER OF WATER NEAR THE NORTHWEST SHORE OF TOPAZ LAKE, DOUGLAS COUNTY, NEVADA,
Geological Survey, Carson City, Nev.
J. O. Nowlin.
Open-file report 76-419, 1976. 14 p, 5 fig, 1 tab, 3 ref.

Descriptors: *Baseline studies, *Water quality, *Groundwater, *Land development, Septic tanks, Sewage effluents, Data collections, Water analysis, Chemical analysis.
Identifiers: *Topaz Lake area(Nev).

The potential for intensive development of land near Topaz Lake, Douglas County, Nevada, has raised concern regarding the possible effect of septic-tank effluents on the quality of local ground waters and the lake. Analyses of samples from 13 wells, one spring, the lake, and an inflowing creek were examined for trends in chemical composition. Sampled ground waters from sites upgradient in the hydrologic system have higher concentrations of sulfate and dissolved solids than ground waters near the creek and the lake. Preliminary data suggest that the ground-water reservoir in downgradient areas is locally recharged by the creek and perhaps by the lake. (Woodard-USGS)
W76-11674

APPRAISAL OF THE WATER RESOURCES OF CHARLOTTE COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 4C.
W76-11676

GROUND-WATER QUALITY AT THE SITE OF A PROPOSED DEEP-WELL INJECTION SYSTEM FOR TREATED WASTEWATER, WEST PALM BEACH, FLORIDA,
Geological Survey, Tallahassee, Fla.
W. A. J. Pitt, Jr., and F. W. Meyer.
Open-file report 76-91, 1976. 43 p, 8 fig, 8 tab, 8 ref.

Descriptors: *Water quality, *Groundwater, *Baseline studies, *Waste disposal wells, *Test wells, Forecasting, Path of pollutants, Sewage treatment, Sewage effluents, Injection wells, Deep wells, Evaluation, Aquifers.
Identifiers: *West Palm Beach(Fla), Pre-well construction data.

The U. S. Geological Survey collected scientific and technical information before, during, and after construction of a deep test well at the location of a future regional waste-water treatment plant to be built for the city of West Palm Beach, Florida. Data from the test well will be used in the design of proposed deep-well injection system for disposal of effluent from the treatment plant. Shallow wells in the vicinity of the drilling site were inventoried and sampled to provide a data base for detecting changes in ground-water quality during construction and later operation of the deep wells. In addition, 16 small-diameter monitor wells, ranging in depth from 10 to 162 feet, were drilled at the test site. During the drilling of the deep test well, water samples were collected weekly from the 16 monitor wells for determination of chloride content and specific conductance. Evidence of small spills of salt water were found in wells raging in depth from 10 to 40 feet. (Woodard-USGS)
W76-11681

HYDROLOGIC RECONNAISSANCE OF THE PINE VALLEY DRAINAGE BASIN, MILLARD, BEAVER, AND IRON COUNTIES, UTAH,
Geologicsl Survey, Salt Lake City, Utah.
For primary bibliographic entry see Field 4B.
W76-11683

DDT PLUS PCB'S IN BLUBBER OF HARBOR SEALS,
National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
R. E. Anas.
Pestic Monit J. 8(1), p 12-14, 1974.

Descriptors: *DDT, *Polychlorinated biphenyls, *Chlorinated hydrocarbon pesticides, California, Oregon, Washington, Alaska, Columbia River, Islands, Sounds, Sampling, *Pollutant identification.
Identifiers: Phoca-Vitulina-Richardi, *Harbor seals, Seal blubber, Puget Sound(Wash), San Miguel Islands(Calif), Priblof Islaands(Alas).

Samples of blubber from 13 harbor seals (Phoca vitulina richardii) were collected in 1971 from San Miguel Island, Calif. (USA); the Columbia River, Oreg.; Puget Soud, Wash.; and the Pribilof Islands, Alaska. Total amounts of DDT plus PCB's (polychlorinated biphenyls) ranged from 380.7-2350.0 ppm in San Miguel Island seals; 459.4-1620.0 ppm in 2 Puget Sound seals; 27.7-109.9 ppm in 3 Columbia River seals; and 6.8-27.8 pmin 3 Pribilof Island seals. There was no indication of loss of total DDT plus PCBs in 3 samples reanalyzed after 2 yr in frozen storage.--Copyright 1975, Biological Abstracts, Inc.
W76-11698

COMPUTATION OF LETHAL CONCENTRATIONS,
Centre d'Oceanographie, Marseille (France). Station Marine d'Endoume.
G. Stora.
Marine Pollution Bulletin, Vol. 5, No. 5, 1974, p. 69-71, 3 tab, 1 fig.

Descriptors: *Bioassay, Methodology, *Toxicity, *Mortality, *Statistical methods, Analytical techniques, Detergents, *Lethal limit, Annelids, Laboratory methods, Benthos, *Toxins.
Identifiers: Polychaetes, LC50, Population homogeneity.

As they are normally determined, lethal concentrations of toxins to particular organisms are given

within very wide limits. It is possible, however, to test the homogeneity of the population being sampled and derive an accurate value for the lethal concentration, together with confidence limits of that value. (Katz)
W76-11711

THE CONCENTRATIONS OF MERCURY, CADMIUM, LEAD AND COPPER IN FISH AND SHELLFISH OF KOREA, (IN KOREAN),
Pusan Fisheries Coll. (Republic of Korea).
J. H. Won.
Bull Korean Fish Soc. 6(1/2), p 1-19, 1973.

Descriptors: *Mercury, *Cadmium, *Lead, *Copper, *Fish, *Shellfish, Asia, Oysters, Crustaceans, *Heavy metals, Pollutant identification, Water pollution effects.
Identifiers: Exoskeleton, *Korea, Octopus, Squid.

Heavy metal concentrations were detected in fish and shellfish sampled from Oct. 1971-April 1972, in Korea. In general, fish viscera, shellfish muscle and crustacean exoskeletons contained high concentrations of the metals. Samples from the W coast contained relatively high concentrations of Hg, Cu, Cd and Pb, but those of the S coast contained high levels of Cd and Pb. The concentrations of Cu in the samples of the W coast were almost twice as much those of the other coasts. Hg concentrations in the samples raged from 0.02-0.58 ppm with an average of 0.16 ppm. Cd concentrations were higher in fish viscera and shellfish than in fish muscle, ranging from less than 0.02-0.78 ppm with an average of 0.12 ppm in the muscle samples. Pb concentrations were slightly higher in the fish viscera. In muscle and bone the range was 0.06-4.84 ppm with an average of about 1 ppm. Cu concentration was very high in the viscera. Shellfish muscle contained almost 4 times as much Cu as fish muscle, particularly cephalopods, i. e., squid and octopus, contained very high levels of Cu, and oysters collected from Gunsan area on the west coast contained the highest levels of Cu. Cu concentrations ranged from 0.12-28.7 ppm with an average of 1.4 ppm in fish muscle and 5.9 ppm in shellfish muscle.--Copyright 1975, Biological Abstracts, Inc.
W76-11729

DETERMINATION OF M-PHENYLENEDIAMINE IN WATER, (IN RUSSIAN),
Vsesoyuznyi Nauchno-Issledovatelskii Institut Gigieni i Toksikologii Pestitsidov, Kiev (USSR).
N. F. Kazarinova, I. S. Dukhovnaya, and L. E. Myannik.
Gig Sanit. 11, p 61-63, 1974.

Descriptors: *Pollutant identification, Water analysis, Analytical techniques, Organic compounds, *Chromatography, *Methodology.
Identifiers: *Epoxy, *Phenylenediamine, Thin layer chromatography.

A method was developed for determining the toxic substance m-phenylenediamine in water based on extraction of the preparation from water with subsequent quantitative determination with TLC. Migration of m-phenylenediamine from epoxy coatings into water simulating food products depended on the relationship of the ingredients in the coating formula, time of exposure and temperature of the model medium.--Copyright 1975, Biological Abstracts, Inc.
W76-11730

USE OF ANIMAL BEHAVIOR STUDIES IN WATER TOXICOLOGY, (IN RUSSIAN),
Akademiya Nauk SSSR, Tolyatti. Institut Biologii Vnutrennykh Vod.
B. A. Flerov.
Gidrobiol Zh. 10(5), p 114-120, 1974.

Descriptors: *Toxicity, Reviews, *Fish behavior, Invertebrates, *Bioindicators, Metabolism, *Pollutant identification, Testing, *Animal behavior.
Identifiers: Literature reviews.

A literature review on the use of investigations of the behavior of fish and invertebrates in water pollution toxicology is presented. The behavior reactions can serve as indices of the effect of sublethal concentrations of toxic substances. Changes in behavior are the initial signs of metabolic disorders and therefore can be used as operative, sensitive tests for toxicity of the pollutants in the water.--Copyright 1975, Biological Abstracts, Inc.
W76-11731

INTERACTION OF BLUE-GREEN ALGAE WITH MULTIPLY-CHARGED INORGANIC CATIONS, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Inst. of Colloidal Chemistry and Water.
V.I. Zhuravleva, L. A. Kul'skii, and E. S. Matskevich.
Gidrobiol Zh. 10(6), p 82-84, 1974.

Descriptors: *Cyanophyta, *Cations, *Kinetics, Biomass, Salts, *Separation techniques, Flotation, *Algae, *Pollutant identification.
Identifiers: Microcystis-Aeruginosa, *Aggregation.

The kinetics of separation of an algal biomass in the presence of salts formed by multiply charged cations (La, Tl, Al, Fe) with application of a direct electric current to the culture of blue-green algae (Microcystis aeruginosa) was studied. The effectiveness of separating the algal mass from the water increases with decreasing pH. The processes of aggregation and flotation (i.e., formation of neuston film) are due to interaction of the cells with the multiply charged cations and not with their hydrolysis products. These phenomena were not observed on applying a direct current to the algae without the addition of the salts of multiply charged cations and an increase of the application time of the current promoted a more energetic aggregation and flotation.--Copyright 1975, Biological Abstracts, Inc.
W76-11736

A HYPOTHESIS FOR URBAN RAINFALL ANOMALIES,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 2B.
W76-11744

PRACTICAL APPLICATIONS OF SPACE SYSTEMS, SUPPORTING PAPER 5, INLAND WATER RESOURCES.
National Research Council, Washington, D. C. Panel on Inland Water Resources.
For primary bibliographic entry see Field 4A.
W76-11758

USE OF MULTISPECTRAL PHOTOGRAPHY IN WATER RESOURCES PLANNING AND MANAGEMENT IN NORTH CAROLINA,
North Carolina State Univ., Raleigh. Dept. of Geosciences.
C. W. Welby.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-257 098, $6.00 in paper copy, $3.00 in microfiche. North Carolina Water Resources Research Institute, Raleigh, UNC-WRRI Report No. 115, June 1976. 110 p, 32 fig, 7 tab, 14 ref. OWRT A-076-NC, 14-31-0001-4033.

Descriptors: *Aerial photography, *Photogammetry, *Monitoring, *Pollutant identification, Water management(Applied), Photography, Water quality, Planning, *North Carolina, Biomass, Secchi disc, Measurement.
Identifiers: *Multispectral photography, Chowan River(NC).

A series of multispectral aerial photographic missions were flown over the Chowan River of North Carolina to study and evaluate possible uses of multispectral photography in planning for and management of North Carolina's water resources. Flights were also made over parts of the Cape Fear River and Northeast Cape Fear. The report describes how the technique might be used to trace pollutants associated with turbid water and how water draining from the swamps might be traced in larger water bodies. The technique has potential usefulness for monitoring phytoplankton buildups and can be used even if only limited groundtruth is available. Areas of apparently differing water quality were monitored by the multispectral photography both in the Chowan River and in the Northeast Cape Fear River. A technique was developed by which the difference between the extinction depths of a red quadrant and a white quadrant on a modified Secchi disc can be used with water sampling and analysis to obtain biomass concentrations indirectly. This relationship can be one of the groundtruth measurements used to establish relationships between the reflectance characteristics of a water body and various water quality parameters direcly or indirectly. (Stewart-North Carolins State)
W76-11773

EFFECTS OF SUB-NORMAL TEMPERATURES ON SOME COMMON LOS ANGELES HARBOR ANIMALS,
University of Southern California, Los Angeles
Allan Hancock Foundation.
For primary bibliographic entry see Field 5C.
W76-11796

PRELIMINARY INVESTIGATIONS OF THE EFFECTS OF RESUSPENDED SEDIMENT ON TWO SPECIES OF BENTHIC POLYCHAETES FROM LOS ANGELES, HARBOR,
University of Southern California, Los Angeles
Allan Hancock Foundation.
For primary bibliographic entry see Field 5C.
W76-11799

SAND FLATHEAD (PLATYCEPHALUS BASSENSIS) AN INDICATOR SPECIES FOR MERCURY POLLUTION IN TASMANIAN WATERS,
Tasmanian Dept. of Agriculture, Hobart (Australia). Sea Fisheries Div.
For primary bibliographic entry see Field 5B.
W76-11820

REGIONAL CHARACTERISTICS OF TOTAL DISSOLVED MINERALS IN STREAM WATERS IN ILLINOIS,
Northern Illinois Univ., DeKalb. Dept. of Geology.
R. C. Flemal, and M. M. Nienkerk.
Water Resources Bulletin, Vol. 12, No. 3, p 501-509, June 1976. 2 fig, 4 tab, 10 ref. S-046-ILL.

Descriptors: *Water chemistry, *Chemical analysis, *Illinois, *Dissolved solids, *Natural streams, *Mineralogy, Analytical techniques, Water analysis, Water quality, Water properties, Streams, Rivers, Surface waters, Urban runoff, Sulfates, Carbonates, Geology, Water pollution sources, Regions.
Identifiers: *Dissolved minerals, *Illinois River(Ill), *Fox River(Ill), *Vermilion River(Ill), Environmental quality, Regional characteristics.

Using water analyses from 67 gaging stations, discharge-frequency-weighted mean concentrations and average annual yield per unit area were determined for the total dissolved mineral content of Illinois streams. The resultant data indicate that total dissolved mineral contents are controlled by regional rather than local factors. In most cases plausible explanation for the magnitudes could be found in regional patterns of natural and demographic conditions. Although the data suggest

hat total dissolved minerals are increasing, the elative contributions of natural versus nthropogenic phenomena were difficult to delimit t this level of investigation. (Henley - ISWS)
V76-11857

TMOSPHERIC SULFUR: ITS EFFECT ON HE CHEMICAL WEATHERING OF NEW EN-LAND,
artmouth Coll., Hanover, N.H. Dept. of Earth ciences.
. M. Johnson, and R. C. Reynolds.
cience, Vol 177, p 514-16, 1972. 3 p, 1 fig, 1 tab.

escriptors: *Hydrogen sulphide, *Chemical gradation, *Cations, *Bicarbonates, Veathering, Aging(Physical), Geomorphology, n exchange, Anions, *New England, *New ampshire, Air pollution, Path of pollutants, Fos- fuels, Water pollution sources, Water pollution fects.
entifiers: Hubbard Brook Experimental orest(NH).

cessive deposits of atmospheric sulphur ginating from fossil fuel burning has long aracterized the Northeast, especially New En- nd. This study records the extent and con- uences of atmospheric pollution around the bbard Brook Experimental Forest in New mpshire. The rainwater of New England con- ns 3 to 4 milligrams per liter (mg/liter) of sulfate, ereas normal precipitation on a worldwide is, saturated with carbon dioxide, is much less dic. As a result, New England rainwater pH is out 4.1, compared to normal 5.7, and the domi- t anion in the Hubbard Brook streams is sulfate ner than the normally dominant anion bicar- ate. The higher acidity of the Hubbard Brook er would tend to indicate that chemical thering rates of rocks would be higher than mal. The studies indicate, however, that thering reactions in the area are relatively in- plete, possibly because of the maturity of the a soil. The studies also show that cationic denu- on in the Hubbard Brook area is considerably er than normal, thus indicating that carbona- reactions are responsible for denudation. New lies are required to more fully evaluate the lts. (Comer-Florida)
-11890

VELOPMENT OF BUOY MOUNTED DROCARBON VAPOR SENSORS FOR USE LOCAL AREA POLLUTION SURVEIL-CE SYSTEMS,
west Research Inst., Kansas City, Mo.
. Goodson, W. B. Jacobs, and S. K. Puent.
lable from the National Technical Informa- Service, Springfield, Va 22161, as AD-A022 $4.50 in paper copy, $3.00 in microfiche. U.S. t Guard Report No. USCG-D-10-76, July 110 p, 33 fig, 2 tab, 3 ref, 2 append. DOT-034320-A.

riptors: *Continental Shelf, *Monitoring, spills, *Oil pollution, *Water pollution, ources development, Buoys, Lakes, Oceans, ronment, Pollution abatement, *Pollutant ification.
ifiers: *Outer Continental Shelf, Hydrocar- Vapor sensors, Surveillance, Marine en- ment.

easibility of using hydrocarbon vapor sensors oys along watercourses for the signalling of ills on a real time basis has been investigated. result of laboratory testing of five types of sensors, it was concluded that the Taguchi conductor Gas Sensor (TGS) was promising his application. Two other vapor sensors ed by the U. S. Coast Guard for further in- ation were the Esso oil on water piezoelec- nsor and the Environmental Measurement ns' Adhistor sensor (WSM-350). These three rs were evaluated in the laboratory, in the rooftop environment, and in a lake environment. The TGS sensor and the Adhistor sensor were also investigated in the marine environment. Recommendations for further testing and evaluation of the TGS sensor on buoys are made. (Sinha-OEIS)
W76-11930

OIL-IN-WATER CONTENT MONITOR DEVELOPMENTAL PROGRAM SUMMARY,
Coast Guard, Washington, D.C. Office of Research and Development.
R. W. Montfort.
Available from the National Technical Information Service, Springfield, Va 22161 as AD-A-022 960, $4.00 in paper copy, $3.00 in microfiche. Interim Report No. USCG-D-188-75, December 1975. 39 p, 18 fig, 1 tab, 3 ref.

Descriptors: *Continental Shelf, *Water quality control, *Oil pollution, *Monitoring, *Environmental effects, *Water pollution, *Instrumentation, Oily water, Water pollution sources, Fluorescence.
Identifiers: *Outer Continental Shelf, Bilge water, Light scattering.

Feasibility of three concepts for oil-in-water content monitors developed under separate Coast Guard contracts is described. The three methods - oil fluorescence synchronous scanning, light scattering at ninety degrees ratioed against light transmission, and small angle forward light scattering ratioed against light transmission - allow the breadboard monitors to measure oil linearly over the range of 0 to 100 ppm when oil type is known. Also, a second phase feasibility study is described. The work includes: modifying the monitors to improve their sensitivity and selectivity to oil, thus reducing the envelope of curves due to different linear responses to different oil types, and reducing background bias due to particulates or varying water conditions; resolving areas of uncertainty that came to light during the first phase; and demonstrating the instruments' capabilities and limitations in monitoring the effluent from an oily water separator. (Sinha-OEIS)
W76-11941

TRACE METALS IN OYSTERS FROM KNYSNA ESTUARY,
National Physical Research Lab., Pretoria (South Africa).
For primary bibliographic entry see Field 2L.
W76-11966

INORGANIC CHEMICALS MANUFACTURING POINT SOURCE CATEGORY.
Environmental Protection Agency,Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-11992

AMOUNTS AND SPECTRAL PROPERTIES OF DISSOLVED ORGANIC COMPOUNDS FROM SOME FRESHWATER OF THE SOUTHEASTERN U.S.,
Savannah River Ecology Lab., Aiken, S. C.
W. M. Lewis, Jr., and J. A. Tyburczy.
Arch Hydrobiol. 74(1), p 8-17, 1974. (In Engl. with Engl. and Ger. summ.).

Descriptors: *Southeast U.S., *Organic compounds, Freshwater, Dissolved solids, *Gas chromatography, *South Carolina, Coastal plains, *Pollutant identification, Lakes, Rivers, Streams.

Collections of stream, river, and lake water taken from the coastal plain area of South Carolina were analyzed for dissolved organic C using gas chromatography. Complete absorbance spectra between 200-950 mn were also obtained on many of the samples so that statistical tests could be made of the intensity and form of the absorbance-organic carbon relationship at various wavelengths. Dissolved organic C levels averaged about 7 ppm in the predominately dark-water areas covered by the survey and ranged between 3-16 ppm. Correlations between organic C and absorbance reached a maximum of about 0.92 between 300-360 nm. The upper end of this range, specifically 360 nm, offers maximum sensitivity consistent with minimum relative variance as determined by the analysis of regression slopes at all wavelengths. Change in the intercept of the dissolved C-absorbance relation at various wavelengths is apparently related to the presence of 3 or more groups of compounds with differing optical properties. The data are used to derive an equation that accurately predicts dissolved organic C from absorbance at any wavelength between 260-360 nm. The precision of this prediction and its possible general applicability are discussed.--Copyright 1975, Biological Abstracts, Inc.
W76-12138

TRANSFORMATIONS OF METHYLAMINES AND FORMATION OF A HAZARDOUS PRODUCT: DIMETHYLNITROSAMINE, IN SAMPLES OF TREATED SEWAGE AND LAKE WATER,
International Inst. of Tropical Agriculture, Ibadan (Nigeria).
For primary bibliographic entry see Field 5B.
W76-12141

ADSORPTION OF PICLORAM (4-AMINO-3,5,6-TRICHLOROPICOLINIC ACID) ON PANOCHE, EPHRATA, AND PALOUSE SOILS: A THERMODYNAMIC APPROACH TO THE ADSORPTION MECHANISM,
California Univ., Davis. Dept. of Water Science and Engineering.
For primary bibliographic entry see Field 5B.
W76-12142

AN EVALUATION OF THE MILLER METHOD FOR DISSOLVED OXYGEN ANALYSIS,
Wollongong Univ. Coll. (Australia). Div. of Biology and Chemical Sciences.
J. Ellis, and S. Kanamori.
Limnol Oceanogr. 18(6), p 1002-1005, 1973.

Descriptors: *Dissolved oxygen, *Methodology, Oxygen, Salinity, *Volumetric analysis, *Analytical techniques, Pollutant identification.
Identifiers: Dissolved, Method, Miller, Oxygen, pH, Standardization, Winkler Miller method(Analysis), Winkler method(Analysis).

The Miller and Winkler methods for dissolved O2 determination are compared over a range of salinities and O2 levels. By performing the Miller titration using a capillary sidearm flask, atmospheric O2 may be excluded and a precision of +O.O5 mg O2 liter-1 obtained. The Miller end point is highly dependent on pH and on the ratio of NaOH to sodium potassium tartrate, so that carefully standardized conditions must be used to obtain accurate and reproducible results.--Copyright 1974, Biological Abstracts, Inc.
W76-12144

REDOX POTENTIALS IN SOIL COLUMNS INTERMITTENTLY FLOODED WITH SEWAGE WATER,
Mississipi State Univ., State College. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W76-12145

COLORIMETRIC DETERMINATION OF PARAQUAT RESIDUES IN SOIL AND WATER,
Environmental Protection Agency, Athens, Ga. Southeast Environmental Research Lab.
J. D. Pope, Jr., and J. E. Benner.
J Assoc Off Anal Chem. 57(1); p 202-204, 1974.

Descriptors: *Pesticide residues, *Pollutant identification, *Colorimetry, *Agricultural runoff, *Paraquat, Herbicides, Analytical techniques, Soil analysis, Water analysis.

A modified colorimetric method is presented for the determination of paraquat in agricultural runoff samples. The soil extraction step of existing methods is shortened, making the method more suitable for routine analysis of large numbers of samples. Recoveries from spiked soil samples (0.5-5.0 ppm) and water samples (0.1-2.0 ppm) averaged 91-98 and 80-94%, respectively.--Copyright 1974, Biological Abstracts, Inc.
W76-12149

5B. Sources Of Pollution

CONTRIBUTION TO THE STUDY OF STORM WATER IN URBAN ENVIRONMENT (CONTRIBUTION A L'ETUDE DES EAUX DE RUISSELLEMENT EN MILIEU URBAIN),
For primary bibliographic entry see Field 5A.
W76-11637

A PRELIMINARY EVALUATION OF THE CHEMICAL CHARACTER OF WATER NEAR THE NORTHWEST SHORE OF TOPAZ LAKE, DOUGLAS COUNTY, NEVADA,
Geological Survey, Carson City, Nev.
For primary bibliographic entry see Field 5A.
W76-11674

EFFECT OF ATMOSPHERIC STABILITY ON WATER TEMPERATURE PREDICTIONS FOR A THERMALLY LOADED STREAM,
Pennsylvania State Univ., University Park. School of Forest.
D. R. DeWalle.
Water Resources Research, Vol. 12, No. 2, p 239-244, April 1976. 3 fig, 2 tab, 19 ref. OWRT C-4199(No. 9032)(2).

Descriptors: *Model studies, *Energy budget, *Water temperature, *Heat transfer, *Discharge(Water), Air-water interfaces, Air temperature, Humidity, Wind velocity, Radiation, Equations, Pennsylvania, Atmosphere, *Thermal pollution.
Identifiers: *Atmospheric stability, *Shulyakovskiy equation, *Hefner equation, *Susquehanna River(West branch).

A steady state one-dimensional energy budget equation was numerically integrated to predict water temperatures in a 5.45-km-long thermally loaded stream reach for 131 five- or six-hour periods. Downstream water temperature prediction errors (measured minus predicted) using Jobson's Lake Hefner evaporation equation averaged -2.11 C and were well correlated (R2 = 46%) with an index to atmospheric stability. Use of a modified form of Shulyakovskiy's evaportion equation, which includes a term for evaporation by free convection, significantly reduced the average prediction error to 0.89 C and eliminated the effects of atmospheric stabilty (R2 less than 1%). Correction of wind velocity data for the velocity of the air relative to the stream velocity also reduced prediction errors. (Lardner - ISWS)
W76-11690

BACTERIAL POPULATIONS OF AQUATIC SYSTEMS RECEIVING DIFFERENT TYPES OF STRESS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Center for Environmental Studies.
For primary bibliographic entry see Field 5C.
W76-11704

CHRONIC OIL CONTAMINATION AND AQUATIC ORGANISMS WITH EMPHASIS ON DIPTERA: STATUS AND BIBLIOGRAPHY,
Vermont Univ., Burlington. Dept. of Entomology.
For primary bibliographic entry see Field 5C.
W76-11709

HYDROCARBONS IN THE SARGASSO SEA SURFACE MICROLAYER,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
T. L. Wade, and J. G. Quinn.
Marine Pollution Bulletin, Vol. 6, No. 4, 1975. p. 54-57, 1 tab., 19 ref.

Descriptors: Oil, *Oil spills, *Oil pollution, *Oil-water interfaces, *On-site investigations, *On-site data collections, Water analysis, Absorption, Methodology, Infrared spectrometry, Water pollution sources.
Identifiers: *Sargasso Sea, *Pelagic tar, Surface micro-layers.

Small particles of weathered pelagic tar are suggested as a major source of hydrocarbons found in surface microlayer and subsurface water sample collected in the Sargasso Sea. (Katz)
W76-11710

POLLUTION OF THE MEDITERRANEAN AROUND NAPLES,
Durham Univ. (England). Dept. of Botany.
C. R. C. Sheppard, and D. J. Bellamy.
Marine Pollution Bulletin, Vol. 5, No. 3, 1974, p. 42-44, 2 tab., 3 fig., 3 ref.

Descriptors: *Lead, *Zinc, *Copper, *Oil pollution, Invertebrates, Chemical analysis, *Marine benthos, Sewage, Nickel, Manganese, Mussels, *Molluscs, Bays.
Identifiers: *Mediterranean Sea, *Bay of Naples, *Castellabate, Sea urchins, Paracentrotus, Arbacia, Tissue content, *Mytilus, Italy.

The Mediterranean has a reputation for being highly polluted, and the cholera outbreak in southern Italy last year added to the concern about the condition of that sea. There have, however, been few biological surveys. An unpolluted area south of Naples has been declared a national park, to monitor the health of the Mediterranean in that area. This report compares conditions there with those in the Bay of Naples. (Katz)
W76-11713

SELENIUM AND HEAVY METALS IN BLACK MARLIN,
Chief Secretary's Dept., Sydney (Australia). New South Wales Fisheries Branch.
For primary bibliographic entry see Field 5C.
W76-11716

EXPORT OF LEAD FROM SALT MARSHES,
Marine Biological Lab., Woods Hole, Mass. Boston Univ. Marine Program.
M. Banus, I. Valiela, and J. M. Teal.
Marine Pollution Bulletin, Vol. 5, No. 1, 1974, p. 6-9, 2 tab., 2 fig., 21 ref.

Descriptors: *Lead, *Heavy metals, Water pollution sources, *Marshes, *Marsh plants, *Sediments, *Salt marshes, Nitrogen, Grassed waterways, Grasses, Tidal effects, Tidal marshes, Tidal streams, Estuarine environment, Massachusetts.
Identifiers: Salt marsh sediments, Saltwater cardgrass, Spartina alterniflora.

Lead accumulates in shallow salt marsh sediments and is taken up by grasses. Since about half of the annual grass crop is transported to the sea after the grass dies, this may contribute to the movement of lead to deeper waters. Where nitrogen additions increase the biomass of grasses, or where very heavy lead contamination takes place, substantial amounts of lead may be removed by tides from the marsh surfaces (Katz)
W76-11717

MERCURY CONTENT OF MUSSELS FROM WEST EUROPEAN COASTS,
Central Lab. TNO, Delft (Netherlands).
P. DeWolf.
Marine Pollution Bulletin, Vol. 6, No 4, 1975, p. 61-63, 5 tab., 1 fig., 2 ref.

Descriptors: *Mussels, *Molluscs, *Commercial shellfish, *Marine fish, Food, Atlantic Ocean, Benthic fauna, *Metals, Intertidal areas, *Mercury.
Identifiers: Mytilus edulis, Mytilus galloprovincalis, France, North Sea, Denmark, England, Scotland, Rhine estuary, Belgium, Germany.

Mussels have been sampled from the east side of the North Sea from Arcachon in France to Cape Skagen in Denmark and on the west side from Lands End to Edinburgh. High levels of mercury occur in mussels taken from the vicinity of the Rhine and Eems Dollard, and values on the British coast are generally higher than on the east side of the North Sea. (Katz)
W76-11718

PLASTIC PARTICLES FOUND IN TERN PELLETS, ON COASTAL BEACHES AND AT FACTORY SITES,
American Museum of Natural History, New York.
H. Hays, and G. Cormons.
Marine Pollution Bulletin, Vol. 5, No. 3, 1974, p. 44-46, 2 fig.

Descriptors: *Industrial wastes, Environmental effects, Marine animals, *Birds, *Gulls, *Waterfowl, *Shore birds, Beaches, Seashores, Atlantic Ocean, *Food chains, Sewage, *Plastics.
Identifiers: *Polystyrene, *Terns, Tern pellets.

Small polystyrene particles, evidently of industrial origin, now appear as a contaminant of the sea in several parts of the world. They have been discovered in pellets of indigestible food regurgitated by gulls and terns, so are clearly entering the food chain at some point. So far as is known they are harmless but it would be as well to exercise caution in releasing plastic to the environment. (Katz)
W76-11720

SEASONAL VARIATION OF DISSOLVED METALS IN INSHORE WATERS OF THE MENAI STRAITS,
University Coll. of North Wales, Bangor. Marine Science Labs.
A. W. Morris.
Marine Pollution Bulletin, Vol. 54, No. 4, 1974, 54-59, 7 fig., 14 ref.

Descriptors: *Heavy metals, *Sea water, *Seasonal variability, *Salinity, *Water temperature, Analytical procedures, Chlorophyll, Zinc, Copper, Nickel, Manganese, Dissolved solids, Ions.
Identifiers: *Ionic zinc, Organically associated zinc, Ionic copper, Organically associated copper, Ionic manganese.

Many surveys of trace contaminants of seawater are based on the supposition that the situation is static. Little is known about seasonal fluctuations in the concentrations of these contaminants and less about the cause of this variation. Fluctuations in freshwater carrying metals or sediment that will trap contaminants, changes in movements of water masses in the sea, as well as the use of trace metals by marine organisms, are all contributory factors. Local hydrography, seasonal variability and physico-chemial state cannot be neglected in studies of the occurrence of dissolved trace metals in coastal waters. (Katz)

6-11722

RECASTING THE DANGER OF ORGANIC MPOUNDS IN THE ENVIRONMENT, (IN SSIAN),
primary bibliographic entry see Field 5C.
6-11734

THE PROROCENTRUM RED TIDE OCRRED IN THE COASTAL WATERS OF YOURA, FUNKA BAY, HOKKAIDO, IN SEPMBER, 1973, (IN JAPANESE),
primary bibliographic entry see Field 5C.
5-11740

THREE-DIMENSIONAL NUMERICAL DEL OF THE ESTUARY CIRCULATION D SALINITY IN NARRAGANSETT BAY,
de Island Univ., Kingston. Graduate School of anography.
primary bibliographic entry see Field 2L.
-11746

ODEL OF TURBULENT DIFFUSION,
nische Hogeschool, Delft (Netherlands). . of Civil Engineering; and Technische school, Delft (Netherlands). Lab. of Fluid anics.
primary bibliographic entry see Field 2E.
11770

OF MULTISPECTRAL PHOTOGRAPHY IN ER RESOURCES PLANNING AND AGEMENT IN NORTH CAROLINA,
a Carolina State Univ., Raleigh. Dept. of ciences.
rimary bibliographic entry see Field 5A.
11773

TE INJECTION INTO THE HAWAIIAN BEN-HERZBERG AQUIFER: A LABORA- STUDY USING A SAND-PACKED RAULIC MODEL,
ii Univ., Honolulu. Water Resource rch Center.
Wheatcraft, F. L. Peterson, and D.L. aker.
ble from the National Technical Informaervice, Springfield, Va 22161, as PB-257 060, n paper copy, $3.00 in microfiche. Technical No. 96, February 1976. 88 p, 30 fig, 1 tab, 2 append. OWRT B-038-HI(2), 14-31-0001-4-31-0001-5011.

tors: *Waste disposal, *Groundwater, ion, Laboratory tests, *Model studies, ii, Simulation analysis, Saline water-freshnterfaces, Aquifer characteristics.
ers: *Ghyben-Herzberg aquifer, *Sand- model, Buoyant plume, Injection rates, water entrainment, Plume mechanics.

n of wastes into the Hawaiian subsurface ment presents unique problems because te effluent normally are injected into the brackish water underlying the fresh -Herzberg lens. Because waste water comhas approximately the same density as ater, in addition to any ambient groundlow effects, a buoyant uplift is produced auses the injected waste to move upward ward from the injection point as a buoyant A laboratory sand-packed hydraulic model d to study the mechanics of buoyant plume nt, and the entrainment of salt water by ie. Simulated waste effluent was injected density-stratified aquifer system under oundwater conditions, and the effects on echanics of varying several different inarameters, such as injection depth, injec-, type of injection source, density of water, etc., were observed. The laboratory studies indicated that the depth of injection with respect to the salt-fresh interface had the greatest effect on plume mechanic of any of the injection parameters varied. Variation of injection rate had the next greatest effect. It also was observed that for the conditions stipulated in this study, very little salt water was entrained by the injected waste effluent and, thus, the buoyant plume was observed to rise well into the freshwater zone.
W76-11777

NITROGEN CYCLING IN MICROCOSMS AND APPLICATION TO THE BIOLOGY OF THE NORTHERN ARM OF THE GREAT SALT LAKE,
Utah State University, Logan. Dept of Biology.
For primary bibliographic entry see Field 5C.
W76-11778

PUBLIC LAW 92-500: TECHNOLOGY ASSESSMENT, TECHNICAL VOLUME.
National Commission on Water Quality, Washington, D.C. Technology Assessment Sector.
For primary bibliographic entry see Field 5G.
W76-11780

EVALUATION OF SLUDGE DUMPING OFF DELAWARE BAY,
Delaware Univ., Lewes. Coll. of Marine Studies.
L. Watling, W. Leatham, P. Kinner, C. Wethe, and D. Maurer.
Marine Pollution Bulletin, Vol. 5, No. 3, 1974, p 39-42, 3 tab, 1 fig, 9 ref.

Descriptors: *Marine animals, *Sediments, Sludge, *Sludge disposal, *Sewage sludge, *Trace elements, *Environmental effects, Atlantic Ocean, Sewage disposal, Benthos, Invertebrates, Delaware, Mollusks, Statistical analysis, Organic matter.
Identifiers: *Sludge characteristics, *Sludge dumping, Diversity values, Correlation coefficients, *Nucula proxima, *Delaware Bay.

Sewage sludge from Philadelphia and Camden has been dumped off the mouth of Delaware Bay since 1961. Local residents have claimed that sludge is washed ashore, is a health hazard and has impoverished the fauna of the seabed in the area. An assessment has been made of the composition and abundance of the benthic marine fauna of the dumping grounds. The results suggest that dominant species of the area are changing as particulate organic matter accumulates. (Katz)
W76-11792

MARINE STUDIES OF SAN PEDRO BAY, CALIFORNIA. PART III. THERMAL TOLERANCE AND SEDIMENT TOXICITY STUDIES,
University of Southern California, Los Angeles. Allan Hancock Foundation.
For primary bibliographic entry see Field 5C.
W76-11793

CAESIUM-137: ITS ACCUMULATION IN A LITTORAL COMMUNITY,
University of Manchester Inst. of Science and Technology (England). Pollution Research Unit.
For primary bibliographic entry see Field 5C.
W76-11808

POLYSTYRENE SPHERULES IN THE SEVERN ESTUARY-A PROGRESS REPORT,
Bath Univ. (England). School of Biological Sciences.
S. Kartar, F. Abou-Seedo, and M. Sainsbury.
Marine Pollution Bulletin, Vol. 7(3), 1976, p. 52, 1 tab, 1 ref.

Descriptors: *Sediments, *Organic wastes, *Decomposing organic matter, *Sludge, *Demersal fish, *Path of pollutants, Marine fish, Estuarine fish, *Food habits, *Industrial wastes, Pollution effects, Seasonal.
Identifiers: Polystyrene, *Polystyrene spherules, Stomach contents, Sediment content, *Flounders, Sand gobies, Sea snails, *Severn Estuary, *Bristol Channel, England.

The amount of polystyrene in the mud and sediments of the Severn Estuary and Bristol Channel and in the gut of bottomfish is reduced in 1974 from the amounts observed in 1973. (Katz)
W76-11819

SAND FLATHEAD (PLATYCEPHALUS BASSENSIS) AN INDICATOR SPECIES FOR MERCURY POLLUTION IN TASMANIAN WATERS,
Tasmanian Dept. of Agriculture, Hobart (Australia). Sea Fisheries Div.
T. G. Dix, and A. Martin.
Marine Pollution Bulletin, Vol. 6(9), 1975, p. 142-143, 1 tab, 1 fig.

Descriptors: *Metals, *Mercury, *Path of pollutants, *Marine fish, *Bioindicators, *Tracers, *Demersal fish, Biochemistry, Physiology, Sites.
Identifiers: *Site dependence, Mercury concentration, Tissue mercury concentration, Fish size, *Tasmania, Sand flathead, Platycephalus bassensis.

A state-wide survey of Tasmanian coastal waters has shown that Platycephalus bassensis, a widespread, easily caught, non-migratory demersal finfish, is a useful indicator species for mercury pollution. Using approximately twelve fish at each of 31 locations, the mean total mercury concentration in the muscle tissue ranged from 0.03 to 1.06 mg/kg (fresh wt basis), and clearly demonstrated a site dependence for mercury uptake in this species. The correlation between mercury concentration and fish size is shown to be valid only if the effect of location is taken into account. Even then, size accounts for only about 10% of the total variability in mercury concentration. (Katz)
W76-11820

REGIONAL CHARACTERISTICS OF THE TOTAL DISSOLVED MINERALS IN STREAM WATERS IN ILLINOIS,
Northern Illinois Univ., DeKalb. Dept. of Geology.
For primary bibliographic entry see Field 5A.
W76-11857

A COMPARISON OF PHOSPHORUS AND WATER CONTRIBUTIONS BY SNOWFALL AND RAIN IN NORTHEAST OHIO,
Kent State Univ., Ohio. Dept. of Geology.
M. R. McComas, G. D. Cooke, and R. H. Kennedy.
Water Resources Bulletin, Vol. 12, No. 3, p 519-527, June 1976. 2 fig, 2 tab, 15 ref. EPA R801936.

Descriptors: *Phosphorus, *Snowfall, *Phosphates, *Rainfall, *Phosphorus compounds, *Ohio, Analytical techniques, Chemistry, Water pollution sources, Snow, Snowmelt, Surface runoff, Rain, Meteorology, Water sources, Weather, Runoff, Rain water, Storm runoff, Precipitation(Atmospheric), Data collections, Watershed management.
Identifiers: *Twin Lake Watershed(Ohio), Portage County(Ohio), Fine sediment, Detention basins, Lake management.

A record snowfall of 55.8 centimeters occurred on December 1 and 2, 1974, in Portage County, Ohio. An early winter thaw melted the greater part of the snow by December 22, 1974, and a two-day rain fell from December 23 to December 25. These weather events provided an opportunity to compare snowmelt and rainfall contribution to runoff

and phosphorus loading to the Twin Lakes Watershed. Phosphorus concentrations of the snow and rain were determined. Six lake inflows and two lake outflows were measured daily for volume and phosphorus concentration. The snow added 217,000 cubic meters of water and 2.2 kilograms of total phosphorus to the watershed. The rain added 74,000 cubic meters of water and 1.6 kilograms of total phosphorus. Total water discharge from the watershed during December was 244,537 cubic meters and total phosphorus output was 20.3 kilograms. The snow provided 49.9% of the discharge and 8% of the phosphorus whereas the rainfall contributed 28% of the discharge and 6% of the phosphorus. These results indicated that, while snow is a significant source of water, it is not a large source of phosphorus. The greatest contribution of phosphorus comes from fine sediment carried by storm runoff. (Henley - ISWS)
W76-11858

A BOUNDARY VALUE APPROACH FOR ESTUARINE WATER QUALITY MODELLING WITH RESULTS FOR JAMAICA BAY, NEW YORK,
Texas Univ. at Austin. Dept. of Electrical Engineering.
B. J. Olufeagba, R. H. Flake, and N. E. Armstrong.
Ecological Modelling (International Journal on Ecological Modelling and Engineering and Systems Ecology), Vol. 1, No. 1, p 3-30, May 1975. 13 fig, 5 tab, 37 ref.

Descriptors: *Estuaries, *Water quality, *Mathematical models, *Algorithms, Flow, Kinetics, Constraints, Equations, Numerical analysis, Hydrodynamics, Dispersion, Salinity, Simulation analysis, Coliforms, Nitrogen, Biochemical oxygen demand, Dissolved oxygen, Systems analysis, *New York, *Path of pollutants.
Identifiers: *Jamaica Bay(NY), Nonlinear models, Total soluble phosphorus.

Results of water quality modeling for Jamaica Bay, a New York estuary with a large hydraulic circulation, are presented. The two-dimensional topology is approximated by a set of coupled one-dimensional subsystems. The long term steady state water quality problem is then reformulated as a multi-point boundary value problem for ordinary differential equations. Piecewise constant dispersion parameters are estimated from salinity data. A sequential algorithm based on parallel shooting is developed for solving the multipoint problem. The method, which simplifies handling of feedforward and feedback reaction kinetics, is equivalent to employing a high order finite difference technique with the subsequent enhanced accuracy. Results of model verification for uncoupled variables -- salinity, coliform, total soluble phosphorus -- and coupled variables for nitrogen (organic and ammonia) and BOD-DO for Jamaica Bay are discussed. (Bell-Cornell)
W76-11881

MODELS IN WATER QUALITY PLANNING,
Karlsruhe Univ. (West Germany). Institut fuer Siedlungswasserwirtschaft.
R. W. Abendt.
Ecological Modelling (International Journal on Ecological Modelling and Engineering and Systems Ecology), Vol. 1, No. 3, p 205-217, September 1975. 7 fig, 11 ref.

Descriptors: *Water quality, *Mathematical models, *Simulation analysis, Data collections, Methodology, Rivers, Measurement, Flow, Water temperature, Systems analysis, Equations, Europe.
Identifiers: *Neckar River quality model(W Germany), Error, Oxygen balance, Model accuracy, Black box method.

This paper shows the range of applicability of water quality models. It clarifies the purpose of modelling with respect to the exactness of results and it investigates problems of data collection. The data quantity and objective of modelling influence the model structure, i.e., the mathematical complexity. Two principal errors are investigated: first, the error caused by the mathematical abstractions of the natural processes in a model, and on a subsequent level, the wrong parameter estimates in a model. Furthermore, the difference between a deterministic descriptive, and a statistical approach, is discussed. In both model types, input and objectives are the same. But the methodology is fundamentally different. A practical example is presented based on a two-parameter water quality model. The limits and practicability of the Neckar River quality model are discussed in this context. (Bell-Cornell)
W76-11882

SOME ASPECTS OF MODELLING THE LONG-TERM BEHAVIOUR OF AQUATIC ECOSYSTEMS,
Technical Univ. of Denmark, Lyngby. Inst. of Mathematical Statistics and Operations Research.
J. C. Behrens, J. E. Beyer, O. B. G. Madsen, and P. G. Thomsen.
Ecological Modelling (International Journal on Ecological Modelling and Engineering and Systems Ecology), Vol. 1, No. 3, p 163-198, September 1975. 28 fig, 17 ref, append.

Descriptors: *Aquatic environment, *Ecosystems, *Behavior, *Computer models, *Water pollution control, *Water quality, *Eutrophication, Fjords, Numerical analysis, Water resources, Planning, Simulation analysis, Computer programs, Waste water treatment, Costs, Optimization, Constraints, Systems analysis, Equations.
Identifiers: Sensitivity analysis, Nonlinear system, Factor decomposition approach, Reducing approach, Box model.

Considered is the modelling process in relation to the class of computerized, time-continuous, deterministic models. Following a brief discussion of the formulation of the modelling process, a description of the System Analysis and System Synthesis stages of the modeling of the eutrophication process in a sill fiord is given. Special emphasis is put on the modelling of a general column of the fiord system. Numerical solution methods relevant for long-term studies are discussed and the requirements in terms of their stability and accuracy are formulated. The goal-statements of Sensitivity Analysis are presented, followed by a description of two approaches to the understanding of model behavior. The possibility of determining the sensitivity of a nonlinear system through linearization is discussed, as is the possibility of determining the sensitivity to not well-estimated constants working directly on the nonlinear system. A means of constructing a model of the entire fiord is outlined. Finally, attention is brought to the superior modeling goals through a discussion of the utilization of a hypothetical, credible model of the eutrophication process in the fiord as an element in a tool for resource planning in pollution control. The aspects of using the ecological model in a study of water treatment plans have great importance in the process of planning investments for wastewater treatment. Alternative plans can be compared as to economy and water quality. In complex cases, mathematical programming models can be used in connection with simulation models. (Bell-Cornell)
W76-11883

ECOSYSTEM MODELING OF WATER-HYACINTH MANAGEMENT IN LAKE ALICE, FLORIDA,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
For primary bibliographic entry see Field 5G.
W76-11884

AN ECOLOGICAL MODEL FOR HEAV METAL CONTAMINATION OF CROPS AN GROUND WATER,
Royal Danish School of Pharmacy, Copenhagen
S. E. Jorgensen
Ecological Modelling (International Journal o Ecological Modelling and Engineering an Systems Ecology), Vol. 2, No. 1, p 59-67, Marc 1976. 2 fig, 5 tab, 6 ref

Descriptors *Water pollution control *Wat quality, *Soil contamination, *Mathematic models, *Groundwater, Crops, Sludge, Soils, Sc water, Humus, Clays, Municipal wastes, Regre sion analysis, Computer programs, Equation Systems analysis, *Path of pollutant *Forecasting.
Identifiers: Metal contamination.

Presented is a model used for predicting the hea metal concentration in crops and groundwate The model indicates that Pb is limiting the use sludge as a soil conditioner, and that in most case contamination of crops seems to be greater dang than contamination of groundwater. Howeve when soil with a high humus or clay content used at a pH close to 7.00, municipal sludge can used in considerable quantities without dang (Bell-Cornell)
W76-11885

UNDERGROUND LIQUID WASTE DISPOSAL
American Society of Civil Engineers, New Yo Task Committee on Underground Liquid Disposa
For primary bibliographic entry see Field 5E.
W76-11888

PLASTIC PARTICLES IN SURFACE WATE OF THE NORTHWESTERN ATLANTIC,
National Marine Fisheries Service, Narragans R.I. Narragansett Lab.
J. B. Colton, Jr, F. D. Knapp, and B. R. Burns.
Science, Vol. 185, p. 491-97, 1974. 9 p, 6 fig, 1 ta

Descriptors: *Sampling, *Plastics, *Indust wastes, Currents(Water), *Water pollut sources, *Recreation wastes, *Path of pollutan Biodegradation, Water pollution effe Aesthetics, Water quality, Suspended sol Coasts, Oceans, New York, New Jersey, Floric
Identifiers: *Coastal waters, *Coastal z management.

Because plastics are not biodegradable t remain indefinitely once introduced to the s On a recent ichthyoplankton survey ranging f Cape Cod to the Carribean, plastic sampling taken to determine the types and concentration plastics. The concentration of all plastics greatest in waters above Florida and least in Carribean. Opaque polystyrene spherules wer greatest concentration in coastal waters sout Rhode Island and south of eastern Long Isl These spherules enter oceans only through pla producing and processing plant waste wa Polyethylene cylinders or 'nibs' also enter ocean from plastics plants and are found in hig concentrations off southern New York, the Jersey coast and Delaware. In some areas the centration of plastics is as high as 500 grams square kilometer. Plastic prices and sheet wrappers are the most abundant particle types range throughout the sampling area. These pla are non-toxic and have no major adverse ef on fish. Nevertheless, effective pollution mon ing of the plastics industry is needed to prever proper waste water disposal. (Comer-Florida)
W76-11889

ATMOSPHERIC SULFUR: ITS EFFECT THE CHEMICAL WEATHERING OF NEW GLAND,
Dartmouth Coll., Hanover, N.H. Dept. of Sciences.
For primary bibliographic entry see Field 5A.
W76-11890

ARTH'S HIDDEN ASSET, OUR MOST VALUBLE SOURCE OF WATER IS ALSO THE IOST VULNERABLE,
or primary bibliographic entry see Field 4B.
76-11895

ETROLEUM DEGRADATION IN LOW TEMERATURE MARINE AND ESTUARINE ENIRONMENTS,
node Island Univ., Kingston. Dept. of Plant thology-Entomology.
W. Traxler, and A. M. Cundell.
vailable from the National Technical Informan Service, Springfield, Va 22161, as AD-A020 5, $3.50 in paper copy, $3.00 in microfiche. Anal Report to the Office of Naval Research No. 3, nuary 1976. 18 p, 5 fig, 18 ref. N00014-68-A-5-0013.

scriptors: *Oil pollution, *Estuarine environnt, *Microbial degradation, Water pollution, ter quality control, *Microorganisms, odegradation, *Environmental effects, ochemical oxygen demand, Aquatic environnt, Bacteria, Yeasts, Fungi, Aquatic bacteria.
ntifiers: *Marine environment, ydrocarbons, Hexadecane, Methylcyclohex-, Penicillium sp.

Penicillium sp. shown to utilize n-hexadecane eloped intracellular deposits similar to those n in hydrocarbon-utilizing bacteria and yeast. nning and transmission electron photomicrohs contrast the morphology of hexadecane peptone grown fungi. Laboratory experiments v the capacity for bacterial isolates to utilize ylcyclohexane if provided to the culture from vapor phase. BOD experiments confirm the city of natural mixed microbial flora from arine sources at 7C to utilize certain petroleum ocarbons at 10C. Inocula taken during the ner have a reduced capacity to utilize petroleydrocarbons at 10C and 20C. (Sinha-OEIS)
-11924

ELOPMENT OF BUOY MOUNTED ROCARBON VAPOR SENSORS FOR USE LOCAL AREA POLLUTION SURVEILCE SYSTEMS,
est Research Inst., Kansas City, Mo.
rimary bibliographic entry see Field 5A.
11930

CTS OF FIRE ON NUTRIENT MOVET IN A SOUTH CAROLINA PINE FOREST,
nt de Nemours (E. I.) and Co., Aiken, S. C.
nah River Lab.
Lewis, Jr.
gy. 55(5), p 1120-1127, 1974.

iptors: *Burning, *Nutrients, *South na, *Cations, *Nitrates, *Phosphates, Pine Forest management, Leaching, Cation adon, Magnesium, Calcium, Potassium, Sodiampling.

novement of major cations, nitrate and nate was studied in burned and control areas outh Carolina pine forest (USA). Artificial g of litter showed that fire increased the ity of cations by the following factors: Ca 0x; Mg ++, 10x; Na +, 2.3x; K +, 2.3x. l leaching over a 1 mo. period reduced the ld of burned litter by 80%-83% for divalent and 45%-63% for monovalent cations. ts of soluble nitrate and phosphate were l in burned and unburned litter samples. and phosphate were substantially higher in rainfall at the burned area after the burn, in subsequent rains. Collections of rainfall lout from the burned area consistently conbout twice the amounts of cations present ar collections from the unburned area. Rus low but contained greater amounts of cathe burned area. Samples of superficial groundwater provide some evidence for changes in ionic balance due to burning. Biologically available N and P in the litter is apparently not increased directly by burning, but a rise in soluble nitrate and phosphate occurs some time after the burn and is probably due to increased microbial activity. Large amounts of N are probably volatilized and could exercise important effects on the productivity of systems remote from the burn if some biologically active compounds are included in the vapor. Although the upper soil layers are an efficient adsorption trap for cations, there is a potentially important movement of ions in runoff, in groundwater, or in the wind as particulate matter following a fire.--Copyright 1975, Biological Abstracts, Inc.
W76-11933

COASTAL ZONE POLLUTION BY OIL AND OTHER CONTAMINANTS: GUIDELINES FOR POLICY, ASSESSMENT AND MONITORING IN TROPICAL REGIONS. BASED UPON A CASE STUDY IN INDONESIA, IN 1973,
Smithsonian Institution, Washington, D. C.
P. H. Freeman.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-247 431, $6.00 in paper copy, $3.00 in microfiche. Report Prepared for the Agency for International Development, Dept. of State, 1974. 144 p, 2 fig, 10 tab, refs, 3 append. AID/csd-2608.

Descriptors: *Continental Shelf, *Bibliographies, Pollutants, *Tropical regions, *Pollution abatement, *Water quality control, *Oil pollution, *Environmental effects, *Oil spills, Resources development, Monitoring, Coasts, Fisheries, Cadmium, Mercury, Insecticides, Beaches, Mangrove swamps, Management, Public health.
Identifiers: *Outer Continental Shelf, *Indonesia, Coastal zone, Pollution prevention, Policies, Guidelines, Biological effects, Organochlorine, Coral reefs.

The report provides guidelines useful to tropical nations for the prevention and control of pollution of coastal waters by oil and other contaminants. It reviews the state of knowledge on the effects of pollution by oil in warm tropical waters, sets forth information needed for determining policies for controlling coastal zone pollution by oil, outlines several policy options and their implications and presents recommendations for monitoring coastal pollution. Included in the report is an Annotated Bibliography on the Biological and Ecological Effects of Oil Pollution in Tropical Waters, compiled by C. P. Onuf. (See also W76-11936) (Sinha-OEIS)
W76-11935

THE BIOLOGICAL AND ECOLOGICAL EFFECTS OF OIL POLLUTION IN TROPICAL WATERS. AN ANNOTATED BIBLIOGRAPHY,
Smithsonian Institution, Washington, D. C. Office of International and Environmental Programs.
For primary bibliographic entry see Field 5C.
W76-11936

RESULTS OF OCEAN DIFFUSION AND BIOLOGICAL STUDIES OF THE HOLLYWOOD, FLORIDA, OCEAN OUTFALL,
Environmental Science and Engineering, Inc., Gainesville, Fla.
J. D. Crane, and R. H. Jones.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-247 684, $5.50 in paper copy, $3.00 in microfiche. U. S Environmental Protection Agency, Ecological Research Series No. EPA-600/3-76-003, January 1976. 109 p, 19 fig, 15 tab, 21 ref, 3 append. 57(RI)-01-68.

Descriptors: *Outfall sewers, *Sewage effluents, *Coliforms, *Pathogenic bacteria, Ecology, *Environmental effects, *Waste disposal, Continental Shelf, Florida, Bacteria, *Diffusion, Water pollution sources, *Path of pollutants, *Florida.
Identifiers: *Outer Continental Shelf, Hollywood(Fla).

Full-scale diffusion experiments were conducted to estimate coliform bacteria concentration patterns of sewage effluent from two ocean outfalls located at Pompano Beach and Hollywood, Florida. The experiments consisted of two parts: turbulent diffusion of sewage effluent, and natural die-off of coliform bacteria. For the majority of the diffusion experiments, Rhodamine dye was injected at a continuous rate into the sewage at the sewage treatment plants. Experimental determinations of coliform die-off rates indicated that during the summer months the natural die-off is approximately two orders of magnitude greater than that during the winter. The biological studies consisted of qualitative and quantitative evaluations of the microscopic algae and protozoa of the surface waters and the ocean floor to a distance of about two miles from shore. Detectable effects of the Hollywood outfall were confined to a very small mixing zone in the immediate vicinity of the outfall outlet in which a reduction of plankton was observed. Phytoplankton increase, which would be expected from nutrient enrichment, was not observed to occur as a result of the Hollywood outfall in the areas surveyed. The studies provide no indication that sewage release through the Hollywood outfall had any significant effect on aquatic ecology. (Sinha - OEIS)
W76-11938

A COMPUTER SIMULATION TECHNIQUE FOR OIL SPILLS OFF THE NEW JERSEY-DELAWARE COASTLINE,
Coast Guard Research and Development Center, Groton, Conn.
M. C. Miller, J. C. Bacon, and I. M. Lissauer.
Available from the National Technical Information Service, Springfield, Va 22161, as AD-A018 947, $4.00 in paper copy, $3.00 in microfiche. Final Report No. USCG-D-171-75, September 1975. 48 p, 37 fig, 7 ref.

Descriptors: *Continental Shelf, *Oil spills, *Oil pollution, *Resources development, *Environmental effects, Models, Shores, Beaches, Drilling, New York, New Jersey, Delaware, Hydrodynamics, *Path of pollutants.
Identifiers: *Outer Continental Shelf, *Offshore technology, *Deepwater ports, *New York Bight, *Computer simulation.

Predictions of the movement of oil slicks and their impact locations along the shoreline of New Jersey and Delaware were determined for two potential deepwater ports and two potential drilling sites. A hydrodynamical-numerical model for the New York Bight area was coupled with a wind generating model to produce temporal patterns of concentration of oil. Shoreline impact determinations were made for the four spill sties for the average winter storm conditions and average summer high pressure systems generated by the models. (Sinha - OEIS)
W76-11940

OIL-IN-WATER CONTENT MONITOR DEVELOPMENTAL PROGRAM SUMMARY,
Coast Guard, Washington, D.C. Office of Research and Development.
For primary bibliographic entry see Field 5A.
W76-11941

FOLLOW-UP FIELD SURVEY OF THE OIL POLLUTION FROM THE TANKER 'METULA',
Texas A and M Research Foundation, College Station.
For primary bibliographic entry see Field 5C.
W76-11943

THE ENVIRONMENT AND THE OFFSHORE OIL INDUSTRY IN SCOTTISH WATERS - A REVIEW. PART 1. THE DEVELOPING MARITIME GEOGRAPHIC PATTERN,
Newcastle upon Tyne Polytechnic (England). Dept. of Humanities.
H. D. Smith.
Maritime Studies and Management, Vol 3, No 4, p 205-215, April 1976. 3 fig, 4 ref.

Descriptors: *Oil industry, *Resources development, *Environmental effects, *Water pollution sources, *Oil pollution, *Hazards, Exploration, Continental Shelf, Pipelines, Offshore platforms, Weather, Facilities.
Identifiers: *Outer Continental Shelf, *Scotland, *North Sea, Geographic patterns, Production facilities, Offshore technology.

The developing maritime geographic pattern with special reference to Scottish waters is examined and the relationships between the oil industry and the marine and coastal environments are considered. Important geographical reasons exist for discussing the offshore oil industry primarily with respect to Scotland. First, substantial parts of both proved and potential oil provinces lie in Scottish waters. Sea-bed topography and the configuration of land and sea on a North-West European scale are further reasons why Scotland together with North-East England has become the primary focus of the offshore oil industry of Europe. To understand the relationships between the oil industry and the environment in these areas, several overlapping phases of development must be recognized. First is the exploratory phase which concerns the discovery or delineation of petroleum reserves, associated with the build-up of the service industry in the wider sense and the forging of links with ancillary industries in the manufacturing and service sectors of the economy. The second phase concerns the manufacture and installation of production facilities, associated with the establishment of specialist industries such as production platform construction and pipe-coating; offshore engineering tasks such as pipeline laying and the placing of production platforms and other equipment on the sea bed; and the construction of tanker and gas terminals. The third phase is production. At present the industry is involved in both exploration and the installation of the first production facilities. The pipelines and platforms have already had an impact upon the fishing industry. (See also W76-11946) (Sinha-OEIS)
W76-11945

THE ENVIRONMENT AND THE OFFSHORE OIL INDUSTRY IN SCOTTISH WATERS - A REVIEW. PART 2. THE REGIONAL PATTERN OF DECISION MAKING,
Newcastle upon Tyne Polytechnic (England). Dept. of Humanities.
H. D. Smith.
Maritime Studies and Management, Vol 3, No 4, p 217-220, April 1976. 5 ref.

Descriptors: *Continental Shelf, *Oil industry, *Environmental effects, *Resources development, *Water pollution sources, *Oil pollution, *Decision making, Regions, Regional analysis.
Identifiers: *Outer Continental Shelf, *Scotland, *North Sea, Production facilities, Environmental impact.

This part of the two part review presents an account of the regional pattern, in which the relationship between decision-making and environmental factors are outlined. Clear conflicts of interest have emerged in most of the platform-yard projects between those concerned with conservation of the environment and safeguarding of local community interest on the one hand, and those representing the interest of business and sometimes government on the other. From the environmental point of view, the regional development of the oil industry falls into two contrasting areas. Existing and projected large-scale developments, often on old industrial sites around the Forth, Clyde, and in north-east England, are generally welcomed as diversifying existing industry and employment, thus providing the basis for a sounder regional economy. The second group of regions are those in which pressure of development is greatest and is likely to revolutionize the social and economic structure as well as having several environmental repercussions. Many of the peripheral land areas near the petroleum provinces are remote from major centres of population and industry, as well as being areas of high amenity value. The marine environment itself is also in danger from pollution. While the Inner Sound area falls into this category, and the lochs of the Clyde will be affected considerably, there are undoubtedly three major regions in which environmental and indeed social impact are relatively very great. These are north-east Scotland, the Cromarty Firth and Shetland. The environmental issues and their implications in each of the three areas are discussed. (See also W76-11945) (Sinha - OEIS)
W76-11946

OCS OIL AND GAS - AN ENVIRONMENTAL ASSESSMENT. A REPORT TO THE PRESIDENT BY THE COUNCIL ON ENVIRONMENTAL QUALITY, VOL 5, ANALYSIS OF OIL SPILL STATISTICS.
Massachusetts Inst. of Tech., Cambridge, Mass.
For primary bibliographic entry see Field 6G.
W76-11954

OCS OIL AND GAS - AN ENVIRONMENTAL ASSESSMENT. A REPORT TO THE PRESIDENT BY THE COUNCIL ON ENVIRONMENTAL QUALITY, VOL 5. OIL SPILL TRAJECTORY STUDIES FOR ATLANTIC COAST AND GULF OF ALASKA.
Massachusetts Inst. of Tech., Cambridge, Mass.
For primary bibliographic entry see Field 6G.
W76-11955

HEAVY METALS IN ORGANISMS OF THE ATLANTIC COAST OF S.W. SPAIN AND PORTUGAL,
Bristol Univ. (England). School of Chemistry.
R. D. Stenner, and G. Nickless.
Marine Pollution Bulletin, Vol. 6(6), 1975, p. 89-92, 8 tab, 4 fig, 5 ref.

Descriptors: *Copper, *Lead, *Zinc, *Mercury, *Marine animals, Shores, *Mussels, *Clams, *Crustaceans, *Oysters, Atlantic Ocean, Beaches, Mud flats, Estuaries, Mollusks, Marine plants, Invertebrates, Benthos, Marine fish, Path of pollutants, Water pollution sources.
Identifiers: *Portugal, *Spain(Rio Tinto estuary).

Very high concentrations of copper, lead, zinc, and to a lesser extent mercury, are present in the estuary of the Rio Tinto in South-West Spain. At the mouth of the estuary, the concentrations of these metals fall very sharply towards the natural levels of these metals in organisms living in this part of the Atlantic. (Katz)
W76-11961

ARSENIC IN MARINE ORGANISMS FROM WEST GREENLAND,
B. C. Research Ltd., Vancouver.
For primary bibliographic entry see Field 5C.
W76-11962

TRACE METAL CONTENT IN THE AMERICAN OYSTER,
National Marine Fisheries Service, Milford, Conn. Milford Lab.
For primary bibliographic entry see Field 5C.
W76-11964

DISTRIBUTION OF SOME TRACE METALS I POOLE HARBOUR, DORSET,
Imperial Coll. of Science and Technology, Londo (England). Applied Geochemistry Researc Group.
C. R. Boyden
Marine Pollution Bulletin, Vol. 6(12), 1975, p. 18 186, 8 tab, 3 fig, 19 ref.

Descriptors: *Aquiculture, *Metals, *Oyster Estuarine environment, *Cadmium, *Cobal *Copper, *Iron, *Lead, *Manganese, *Nicke *Zinc, Water quality, Shellfish farming, *Clam *Mussels, Aquatic algae, Sediments, *Trace el ments, Path of pollutants, Distribution.
Identifiers: Poole Harbour, Dorset, *Oyst hatchery, Trace element concentrations, Engli Channel, Ulva, Mytilus edulis, Cockles.

Geochemical investigations in Poole Harbour a its tributary drainage were begun in 1969. In t study the relationships between trace eleme concentrations of water and sediments were amined within several estuaries utilized by oyster industry. Unexpectedly, elevated levels cadmium were recorded in waters from the h bour at Poole, which could not be related to geochemical characteristics of the input draina An oyster hatchery established at Poole moved, March 1972, to a new site within Poole town, immediately encountered problems in the rear of larvae. As elevated cadmium concentrati had already been recorded in the upper harb waters a more detailed examination of the distri tion of trace metals in the vicinity of the hatch was initiated. Concentrations of cadmium, cob copper, iron, lead, manganese, nickel and zinc waters, sediments and biota of Poole Harbour reported. (Katz)
W76-11965

NITRATE POLLUTION AND THE CALIFO NIA ENVIRONMENTAL QUALITY ACT: T APPROPRIATE SOLUTION TO A NEGLECT PROBLEM,
For primary bibliographic entry see Field 5G.
W76-11981

DISTRIBUTION AND ABUNDANCE OF T POLYCHAETOUS ANNELIDS IN A SOU FLORIDA ESTUARY,
University of South Florida, Tampa. Dept Biology.
For primary bibliographic entry see Field 5C.
W76-11987

THE BATTLE OF LAKE SUPERIOR: RESE MINING'S BIG SEWER,
For primary bibliographic entry see Field 5G.
W76-12020

TRANSFORMATIONS OF METHYLAM AND FORMATION OF A HAZARD PRODUCT: DIMETHYLNITROSAMINE, SAMPLES OF TREATED SEWAGE AND L WATER,
International Inst. of Tropical Agriculture, Ib (Nigeria).
A. Ayanaba, and M. Alexander.
J Environ Qual. 3(1), p 83-89, 1974.

Descriptors: *Organic compounds, *Sew Lakes, Nitrogen, Hydrogen ion concentra Ammonia, Nitrates, Nitrites, Microorgan Fungicides, Gas chromatography, *Poll identification.
Identifiers: Carcinogens, *Methylam *Dimethylnitrosamine, *Amines, Thiram.

Added trimethylamine is converted dimethylamine in samples of raw sewage an water, and the secondary amine thus form added dimethylamine disappears with time rates of formation and disappearanc

ethylamine are governed by the pH and the
e and amount of inorganic N present. Ammoni-
is generated from both of the amines.
ethylnitrosamine, a potent carcinogen, is
ied in small amounts in samples of sewage and
water receiving dimethylamine and nitrite, the
imum nitrosamine level detected rising with
easing acidity and increasing dimethylamine
nitrite concentrations. Dimethylnitrosamine
appears in sewage and lake water samples
ving trimethylamine. Microorganisms are in-
ed in some stage of the conversion of the terti-
mine to the secondary amine and dimethyl-
samine in sewage because these products are
found in sterilized sewage. The fungicide
n (tetramethylthiuram disulfide) is converted
methylamine in sterilized sewage at pH 4.0,
mall amounts of dimethylnitrosamine are also
iced in the presence of nitrite; the yields of
products are far greater in nonsterile, thiram-
ded sewage. The identification of dimethyl-
amine was verified by thin-layer and gas
natography, UV and IR spectrometry, and
ined gas chromatrophy-mass spectrometry.--
right 1974, Biological Abstracts, Inc.
12141

**RPTION OF PICLORAM (4-AMINO-3,5,6-
HLOROPICOLINIC ACID) ON PANOCHE,
ATA, AND PALOUSE SOILS: A THER-
YNAMIC APPROACH TO THE ADSORP-
MECHANISM,**
rnia Univ., Davis. Dept. of Water Science
ngineering.
Biggar, and M. W. Cheung.
i Soc Am Proc. 37(6), p 863-868, 1973.

ptors: *Adsorption, *Amino acids, *Loam,
Entrophy, Euthalpy, Thermodynamics,
analysis, Pesticides, Path of pollutants,
ide resudes.
iers: *Picloram, Picolinic-Acid.

dsorption of picloram (4-amino-3,5,6-
opiconlinc acid) was studied on Panoche
m (at pH 4.2 and 1.2), Ephrata sandy loam,
ouse silty loam. The adsorption processes
e described by the Freundlich equation
eundlich constants, K, 1/n, and percentage
ption at 25C: respectively, 0.210, 0.92, and
for Panoche at pH 4.2; 2.5, 0.93, and 30%
oche at pH 1.2; 0.172, 0.99, and 1.9-3.6%
rata; and 1.74, 0.92, and 26-33% for Pa-
lso evaluated were the standard free ener-
opy, and enthalpy associated with the ad-
processes. The values of delta G
ol), delta S (cal/mol per degree), and delta
mol) were: respectively, -1.2 + 0.1, -14 +
5.3 + 0.6 for Panoche at pH 4.2; -2.98 +
+ 2, and -20 + 1 for Panoche at pH 1.2; -
06, -24 + 3, and -9 + 1 for Ephrata; and -
.05, -3.3 + 1.5, and -4.1 + 0.4 for Palouse.
dynamic parameters were useful in assig-
orption mechanisms to the four picloram-
nt-water systems.--Copyright 1974,
al Abstracts, Inc.
42

**POTENTIALS IN SOIL COLUMNS IN-
TTENTLY FLOODED WITH SEWAGE**
i State Univ., State College. Dept. of
y.
isler, J. C. Lance, and R. S. Linebarger.
Qual. 3(1), p 68-74, 1974.

rs: *Sewage, *Oxidation-reduction
Soils, Denitrification, Flooding, Sewage
Soil analysis, *Pollutant identification.

blacked, platinum wire redox potential
tected the possibility of denitrification
perly placed in soil columns intermit-
oded with secondary sewage effluent.
ution of gases from the flooded soil
ntaining 98% N2 verified the detection.

When additional soluble C was added to the sewage water, the redox potential dropped to more negative values (-200 mV) than when ordinary sewage water (+200 mV) was used, indicting that the oxidation states of other elements besides N were changing. The probes functioned for as long as 6 mo. in place without loss of sensitivity.--Copyright 1974, Biological Abstracts, Inc.
W76-12145

5C. Effects Of Pollution

DISINFECTION, DECHLORINATION AND TOXICITY TO FISH,
International Pacific Salmon Fisheries Commission, Cultus Lake (British Columbia). Sweltzer Creek Salmon Research Lab.
J. A. Servizi, and D. W. Martens.
In: Annual Conference Proceedings of the Ontario Section of the American Water Works Association, Pollution Control Association of Ontario, and Ontario Municipal Water Association, April 20-23, 1975, Toronto, Ontario, p 34-44. 4 tab, 18 ref.

Descriptors: *Chlorination, *Toxicity, *Mortality, *Sewage treatment, *Sockeye salmon, Bioassay, Treatment facilities, Fish, Sewage treatment effluents, Water pollution effects.
Identifiers: *Dechlorination.

Studies on chlorine toxicity to fish are reviewed, with particular emphasis on the effect of chlorine disinfection during primary sewage treatment. Continuous flow bioassays on sockeye salmon fingerlings exposed to various dilutions of sewage before and after chlorination revealed that chlorine residuals sufficient to meet disinfection criteria substantially increased the toxicity of the primary effluent. A chlorine concentration of 25% (by volume) in the primary effluent generally resulted in the death of juvenile sockeye within about 96 hours. Chlorination caused a decrease in the average mean survival time from 293 minutes to 32 minutes. Dechlorination using sulfur dioxide brought the mean survival time from 32 minutes up to 434 minutes. Although a comparison of the mean survival times of primary and dechlorinated sewage suggests that the process of chlorination-dechlorination removes more toxicity than that caused by chlorine addition alone, the result is of limited practical significance since the lowest concentration at which mortalities occurred was the same (17% by volume) for both effluents. (See also W76-11249) (Kreager-FIRL)
W76-11645

VIRAL CONTAMINATION OF THE WATER ENVIRONMENT, AN UNDERESTIMATED PROBLEM,
Canada Centre for Inland Waters, Burlington (Ontario).
M. S. Mahdy.
In: Annual Conference Proceedings of the Ontario Section of the American Water Works Association, Pollution Control Association of Ontario, and Ontario Municipal Water Association, April 20-23, 1975, Toronto, Ontario, p 45-64. 1 fig, 7 tab, 31 ref.

Descriptors: *Viruses, *Sewage treatment, *Public health, *Water quality, Water pollution effects, Urine, *Waste water treatment, Infection, Microorganisms, Aquatic microbiology, Diseases.
Identifiers: Feces, Human wastes.

Potential hazards associated with viral contamination of the water environment are discussed. Human viruses shed in the feces and urine have been repeatedly detected in sewage, effluents, and water bodies receiving effluent streams; their presence appears to be due to incomplete inactivation during sewage and water treatment. Viruses that are shed in the feces and/or urine of man include the entero-, adeno-, reo-, cytomegalo, and orbi-viruses as well as hepatitis. With the exception of three types of polioviruses, there are no vaccines available for use by potentially exposed populations. Virus removals in waste water treatment may range from 50-99.9%, depending on the type of treatment. The relatively long survival times of viruses combined with the fact that very small amounts of viruses are capable of infecting a susceptible host suggest the need for increased emphasis on evaluating the types of viruses circulating in communities and the efficiency of sewage treatment techniques. (See also W76-11249) (Kreager-FIRL)
W76-11646

EVALUATION OF TOXICITIES AND ENVIRONMENTAL IMPACT IN 'SYMBIOTIC' WATER REUSE SYSTEMS,
For primary bibliographic entry see Field 5D.
W76-11665

A FICKIAN ANALYSIS OF LAKE SEDIMENT UPSURGE,
Arkansas Univ., Fayetteville. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 2J.
W76-11692

FACTORS INFLUENCING NITRATE TRANSFORMATIONS IN SEDIMENTS,
Purdue Univ., Lafayette, Ind. Agricultural Experiment Station.
R. E. Terry, and D. W. Nelson.
Journal of Environmental Quality, Vol. 4, No. 4, p 549-554, October-December 1975. 7 tab, 16 ref. OWRT A-019-IND(5)

Descriptors: *Nitrification, *Denitrification, *Eutrophication, *Nitrates, Temperature, Sediments, Aeration.
Identifiers: *Immobilization.

The effects of environmental and procedural factors (e.g., aeration, size of sample water/sediment ration, nitrate concentration, glucose addition, temperature, and sterilization) on denitrification in lake and reservoir sediments were evaluated by incubation nitrate-amended natural sediments in the laboratory. The standard laboratory procedure adopted for denitrification studies involved the incubation of small samples of sediment (undried) after addition of a nitrate solution. Denitrification in sediment-water samples was not enhanced by continuously purging samples with helium to create artificial anaerobic conditions. Even though glucose additions enhanced denitrification by 25 to 30%, unamended sediments contained sufficient available organic-D for near maximal rates of denitrification. Denitrification in sediments increased with increasing temperature over the range of 5 to 23C. However, significant denitrification occurred at temperatures as low as 5C. The evaluation of factors affecting denitrification in sediment show that the environmental conditions likely to exist in natural sediments are suitable for denitrification. Anaerobiosis and the high organic matter of most sediments create an ideal environment for microbial denitrification. The levels of nitrate in surface water may in part be controlled naturally by denitrification in sediments. (Skogerboe-Colorado State)
W76-11700

BACTERIAL POPULATIONS OF AQUATIC SYSTEMS RECEIVING DIFFERENT TYPES OF STRESS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Center for Environmental Studies.
D. S. Cherry, R. K. Guthrie, and R. S. Harvey.
Water Resources Bulletin, Vol. 10, No. 5, p 1009-1016, October 1974. 1 fig, 3 tab, 7 ref. OWRT A-022-SC(10).

Descriptors: Freshwater, *Streams, *Bacteria, *Thermal stress, Effects, Pollutants, *Chemical wastes, Water temperature, Sampling, Effluents, Assessment, Water pollution effects.

Identifiers: *Chemical stress, Aquatic systems, Flowing streams.

Bacterial populations in a fast flowing stream receiving chemical wastes and in a slower flowing pond receiving a thermal addition 3-5 C above ambient temperature were compared with populations in a nonpolluted converging stream and an adjacent unheated pond. Parameters measured were total aerobic heterotrophic bacteria, bacterial diversity, percent chromagens of the total bacterial populations, and water temperature. Analyses of monthly samples plated on dilute Standard Plate Count Agar indicated that chemical additives to the waste stream significantly decreased the percent of chromagenic bacteria, and that thermal stress significantly altered total counts and bacterial diversity in the flowing pond. The effects of potential pollutants on these aquatic systems were assessed and are discussed on the basis of results obtained over a 16-month period. (Bell-Cornell)
W76-11704

CHRONIC OIL CONTAMINATION AND AQUATIC ORGANISMS WITH EMPHASIS ON DIPTERA: STATUS AND BIBLIOGRAPHY,
Vermont Univ., Burlington. Dept. of Entomology.
B. L. Parker, J. D. Brammer, M. E. Whalon, and W. O. Berry.

Descriptors: Water Pollution Effects, *Oil Pollution, *Oil wastes, *Bibliographies, *Reviews, *Diptera, *Aquatic insects, *Water pollution sources, *Oil spills, Insects, Invertebrates, Oil, Quality control.
Identifiers: Chronic oil contamination.

A brief overview on the scope and implications of aquatic oil contamination is presented. Particular emphasis is placed on the few studies that have been done with freshwater organisms. In order to facilitate future investigations on the effects of chronic oil spills on aquatic dipterans, a bibliography of related studies (194 references) is included. (Katz)
W76-11709

COMPUTATION OF LETHAL CONCENTRATIONS,
Centre d'Oceanographie, Marseille (France). Station Marine d'Endoume.
For primary bibliographic entry see Field 5A.
W76-11711

CHANGES IN THE ACTIVITY OF FUCOXANTHIN-EXCITED PHOTOSYNTHESIS IN THE MARINE DIATOM PHAEODACTYLUM TRICORNUTUM GROWN UNDER DIFFERENT CULTURE CONDITIONS,
Tokyo Univ. (Japan). Ocean Research Inst.
S. Shimura, and Y. Fujita.
Marine Biology, Vol. 33, p. 185-194, 1975. 2 fig, 6 tab, 28 ref.

Descriptors: *Photosynthesis, Laboratory tests, *Diatoms, Algae, *Primary productivity, *Chlorophyll, Light, Pigments, Temperature, Environmental effects, *Absorption, *Photoactivation, *Plant pigments, Biochemistry, Phytoplankton, Aquatic plants, Carbon cycle, Nutrients.
Identifiers: *Phaeodactylum sp. *Fucoxanthin.

Variation in the photosynthetic activity under monochromatic light was studied in Phaeodactylum tricornutum grown under various culture conditions, with special reference to the composition of photosynthetic pigments. Photosynthetic activity, under light-limiting conditions, was reduced when the cells were grown under strong light. The reduction was more extensive in activity resulting from fucoxanthin-excitation than in that from chlorophyll a-excitation. The diminution in activity for fucoxanthin-excited photosynthesis did not correlate with variations in the pigment content. A similar diminution was observed with chlorophyll a fluorescense upon excitation of fucoxanthin. The change was accelerated by lowering the culture temperature or limiting the supply of nitrogen source. The results were interpreted in terms of a nitrogen-deficient state for algal cells induced by strong light, low temperature or a limited supply of nitrogen. This leads to a modification of the physicochemical state of in vivo fucoxanthin, so that the excitation energy of fucoxanthin is less efficiently transferred to chlorophyll a. The significance of the phenomenon in the oceanic primary production is discussed. (Katz)
W76-11712

WILDFOWL AND POLLUTION IN THE TAY ESTUARY,
Dundee Coll. of Technology (Scotland). Dept. of Physics.
B. Pounder.
Marine Pollution Bulletin, Vol. 5, No. 3, 1974, p. 35-38, 1 tab., 3 fig., 12 ref.

Descriptors: *Birds, *Waterfowl, *Water birds, *Estuarine environment, *Mallard duck, *Mute swan, Shore birds, Sewage effluents, Common Eider duck, *Food chains, Marine animals, Migratory birds, Outfall sewers.
Identifiers: Tufted duck, Goldeneye, Dundee, *Tay estuary(Scotland).

Many British estuaries are important wintering areas for large numbers of northern European wildfowl, and some of the biggest concentrations of the birds feed off large sewer outfalls. The Scottish Ornithologists' Club is organizing a survey to locate the major outfalls along the Scottish coast and the large concentrations of wildfowl which may be dependent upon them. Detailed studies are being made of the flocks feeding off the outfalls in the Tay which serve the city of Dundee. Main findings to date in the Tay are summarized. (Katz)
W76-11714

EFFECT OF CHRONIC OIL POLLUTION ON A POLYCHAETE,
Baghdad Univ. (Iraq). Coll. of Sciences.
M-B. M. Mohammad.
Marine Pollution Bulletin, Vol. 5, No. 2, 1974, p. 21-24, 4 tab., 3 fig., 14 ref.

Descriptors: Oil, *Oily water, *Oil pollution, *Annelids, On-site investigations, Benthic organisms, Benthos, *Fouling, *Methodology, Oil spills, Water pollution effects.
Identifiers: *Fouling organisms, *Test panels, *Arabian Gulf, *Polychaetes, Kuwait, Polychaetes, Species diversity.

The tube-building polychaete Pomatoleios kraussii is an important fouling organism in the Arabian Gulf. Studies have been made of its growth and survival on plates immersed in the water at two sites at Kuwait, one subject to frequent small spillages at an oil terminal, the other free from oil pollution. The temporal sequence and diversity of other encrusting organisms has also been documented at the same sites. P. Kraussii survival decreases as the area coated with oil increases. (Katz)
W76-11715

SELENIUM AND HEAVY METALS IN BLACK MARLIN,
Chief Secretary's Dept., Sydney (Australia). New South Wales Fisheries Branch.
N. J. Mackay, M. N. Kazacos, R. J. Williams, and M. I. Leedow.
Marine Pollution Bulletin, Vol. 6, No. 4, 1975, p. 57-61, 5 tab., 21 ref.

Descriptors: *Mercury, *Selenium, Zinc, Copper, Arsenic, Cadmium, Lead, *Marine fish, *Australia, Commercial fish, Foods, Metals, *Heavy metals, Water pollution sources, Water pollution effects.
Identifiers: *Black marlin, Muscle mercury, Liver mercury, Fish size, Correlation

Black marlin from the apparently unpolluted waters off north-eastern Australia have the highest muscle and liver concentrations of total mercury yet reported for a teleost species. Selenium concentrations are also high. There is a significant correlation between mercury and selenium concentrations, and concentrations of both those elements are significantly correlated to size of fish. Concentrations of cadmium, lead, zinc, copper or arsenic are not so correlated. The results of this study indicate there is a need for a moratorium on the use of this species for human consumption. (Katz)
W76-11716

MERCURY CONTENT OF MUSSELS FROM WEST EUROPEAN COASTS,
Central Lab. TNO, Delft (Netherlands).
For primary bibliographic entry see Field 5B.
W76-11718

TRACE METAL CONCENTRATIONS IN FUCUS FROM THE BRISTOL CHANNEL,
University Coll. of Wales, Aberystwyth. Dept. Geology.
R. Fuge, and K. H. James.
Marine Pollution Bulletin, Vol. No. 1, 1974, p. 12. 1 fig, 2 tab, 9 ref.

Descriptors: Marine plants, *Metals, Zinc, Copper, Manganese, Iron, Nickel, Cadmium, Cobalt, Molybdenum, *Algae, Atlantic Ocean, Water pollution effects, *Trace elements, Absorption.
Identifiers: *Bristol channel, *Brown seaweed, *Fucus vesiculosus, *Trace metals.

Brown seaweeds are unable to regulate their uptake of trace metals and can therefore be used to provide a running average of metal contamination in the surrounding waters. There are many sources of error, however, and misleading results can be obtained if attention is not paid to factors that influence the metal concentrations in the weed. This becomes particularly important when comparing the results of different investigators. (Katz)
W76-11719

PLASTIC PARTICLES FOUND IN TERN PELLETS, ON COASTAL BEACHES AND AT FACTORY SITES,
American Museum of Natural History, New York.
For primary bibliographic entry see Field 5B.
W76-11720

DIETARY HABITS AND HEAVY METAL CONCENTRATIONS IN FISH FROM THE SEVERN ESTUARY AND BRISTOL CHANNEL,
Bath Univ. (England).
M. W. Hardisty, S. Kartar, and M. Sainsbury.
Marine Pollution Bulletin, Vol. 5, No. 4, 1974, p. 61-63, 2 tab., 1 fig., 3 ref.

Descriptors: *Heavy metals, *Marine fish, *Pollutants, Commercial fish, *Zinc, *Cadmium, *Lead, Atlantic Ocean, Mullets, Feeds, Feeding rates, Diets, Channels.
Identifiers: Liparids, Bearded Rockling, Flounder, Whiting, Grey Mullet, *Bristol Channel(England).

Comparisons of the rates of growth, feeding habits and heavy metal levels of flounders from Barnstaple and Oldbury-on-Severn have shown that average the fish from the North Devon coast larger than those from the middle Severn estuary and that there are marked differences in diet. These differences in diet may contribute to much higher zinc levels of the Barnstaple flounder samples. In the six other fish species which have been examined, there is a distinct correlation between the cadmium concentrations of the tissues and the proportion of crustaceans in the

ead concentrations appear to follow a similar end, but no relationship could be detected etween diet and tissue zinc levels. (Katz)
76-11721

TRACE METAL PROBLEM IN POND YSTER CULTURE,
perial Coll. of Science and Technology, London ngland). Applied Geochemistry Research oup.
R. Boyden, and M. G. Romeril.
arine Pollution Bulletin, Vol. 5, No. 5, 1974, p. 78, 6 tab., 1 fig., 10 ref.

scriptors: *Oysters, *Aquiculture, *Heavy tals, *Copper, *Zinc, *Path of Pollutants, Ther- l pollution, Water temperature, Thermal power nts, Animal growth, *Cadmium, Cobalt, Iron, nganese, Nickel, Lead, Sediments, Shrimp, arine plants.
ntifiers: Crangon vulgaris, Crassostrea gigas.

sters reared in power station cooling water ac- nulated high concentration of copper and zinc. reasons for such elevated metal concentra- s and the relevance of these observations to lfish culture have been examined and hasize the care that must be taken to avoid un- ing contamination of culture ponds. (Katz)
5-11723

RCURY ENRICHMENT IN ESTUARINE NT DETRITUS,
ida State Univ., Tallahassee. Dept. of anography.
indberg, and C. Harriss.
ine Pollution Bulletin, Vol. 5, No. 6, 1974, p. 5, 1 tab., 18 ref.

riptors: *Estuarine environment, *Mercury, avy metals, *Mangrove, Aquatic plants, nt tissue, Water pollution Food webs, Food s, Florida, Estuaries, *Detritus.
ifiers: *Red mangrove, Mangrove leaves, grove litter, Bottom detritus.

ive mercury concentrations are enriched by a r of 10 in decomposition products of the red rove, Rhizophora mangle, compared with liv- ant tissue. The mercury content of mangrove us is 3 to 30 times higher than values reported narine phytoplankton. Detritus formation sents a natural mechanism for mercury en- ent in estuarine food chains. (Katz)
11724

LEMOTS WITH DAMAGED PRIMARY HERS,
een Univ. (Scotland). Seabird Group.
P. Bourne.
e Pollution Bulletin, Vol. 5, No. 6, 1974, p. 1 fig., 9 ref.

ptors: *Marine animals, *Oil pollution, pollution effects, Pathology, Oil, *Water *Water fowl, *Birds, *Atlantic Ocean, al pathology, Oil spills.
iers: *Auks, *Guillemots, Primary feathers, r abnormalities.

ingly since the first World War, there have bservations of abnormal wearing of plu- n auks. Various reasons for this have been ed, the most likely being the after-effects ollution. (Katz)
725

TION OF ABNORMAL POLYCHAETE E BY HEAVY METALS,
ia State Univ., Long Beach. Dept. of

ish, F. Piltz, J. M. Martin, and J. Q. Word.
Pollution Bulletin, Vol. 5, No. 8, 1974, p 1 tab, 1 fig, 1 ref.

Descriptors: Metals, *Annelids, *Copper, *Zinc, *Pathology, Benthos, Marine benthos, *Larvae, *Larval growth states, *Heavy metals, Lethal limit.
Identifiers: *Marine polychaetes, Capitella capitata, Sublethal effects, Fatal abnormalities, Polychaete larvae, Abnormal larvae.

A little known observation that exposure to sublethal concentrations of detergent cause fatal abnormalities in the second generation of a polychaete has been followed up and similar abnormalities have been observed in the first or second generation of larvae exposed to sublethal concentrations of copper and zinc. Few toxicity tests extend beyond the responses of the exposed individuals. The discovery of a delayed reaction to sublethal concentrations of common contaminants of the sea has unknown but potentially important ecological implications. (Katz)
W76-11726

SEABIRD MORTALITY IN THE NORTH IRISH SEA AND FIRTH OF CLYDE EARLY IN 1974,
Royal Society for the Protection of Birds, Sandy (England).
C. Lloyd, J. A. Bogan, W. R. P. Bourne, P. Dawson, and J. L. F. Parslow.
Marine Pollution Bulletin, Vol. 5 No. 9, 1974, p 136-140, 1 fig, 5 tab, 8 ref.

Descriptors: *Organochlorine pesticides, *Mortality, *Birds, *Oil pollution, Oily water, *Oil spills, Pathology, Non-game birds, Polychlorinated biphenyls, Dieldrin, DDE, Toxicity.
Identifiers: Tissue analysis, Guillemots, Cormorant, Shags, Gulls, Terns, Auks, *Sea birds, *Irish Sea, *Firth of Clyde.

Heavy mortality of guillemots in the Irish Sea was recorded in 1969 and was the subject of a detailed enquiry. Organochlorine contamination was thought to be a contributory factor, although this could not be conclusively established. These persistent pollutants remain in the environment and further mortalities might be expected if they were indeed responsible. In January, 1974, there was a further heavy loss of seabirds in the area and, this time, investigators were prepared and the incident was carefully monitored. (Katz)
W76-11727

ECOLOGY OF PLANKTONIC INFUSORIA OF SECONDARY-OLIGOTROPHIC LAKE, (IN RUSSIAN),
Gorkii State Univ. (USSR).
M. A. Petrova, and T. P. Smirnova.
Gidrobiol Zh. 10(3), p 25-30, 1974.

Descriptors: *Eutrophication, Lakes, *Oligotrophy, *Plankton, *Ecology, *Protozoa, Seasonal, Distribution, Vegetation, Reproduction.
Identifiers: *Infusoria reproduction, Lionotus-fasciola, Russian-SFSR, Vorticella-campanula, Vorticella-nebulifera, *Lake Svetloyar(USSR).

Investigations of protozoan plankton in the secondary-oligotrophic Lake Svetloyar (Russian SFSR, USSR) showed that it is represented by a restricted number of species. Among them only Lionotus fasciola, Vorticella nebulifera and V. campanula are abundant and account for the largest part of the Protozoa production. The distribution of Protozoa follows the course of the temperature curve; during the vegetative season their bulk is confined to the layers of epi-and metalimnion. The infusoria reproduction rate varies within 0.5-2.4 divisions a day and depends on the cell dimensions. The relation of the reproduction rate to the intensity of consumption is shown. Protozoa production in Aug. and Sept. was 11.7 and 3.1 g/m2, respectively.--Copyright 1975, Biological Abstracts, Inc.
W76-11728

THE CONCENTRATIONS OF MERCURY, CADMIUM, LEAD AND COPPER IN FISH AND SHELLFISH OF KOREA, (IN KOREAN),
Pusan Fisheries Coll. (Republic of Korea).
For primary bibliographic entry see Field 5A.
W76-11729

USE OF ANIMAL BEHAVIOR STUDIES IN WATER TOXICOLOGY, (IN RUSSIAN),
Akademiya Nauk SSSR, Tolyatti. Institut Biologii Vnutrennykh Vod.
For primary bibliographic entry see Field 5A.
W76-11731

EFFECT OF TRIETHYLTIN CHLORIDE ON THE INCORPORATION OF INORGANIC CARBON (NAHC14O3) FROM THE ENVIRONMENT INTO CARP METABOLIC PROCESSES, (IN RUSSSIAN),
Moscow State Univ. (USSR).
N. S. Stroganov, O. V. Parina, and K. F. Sorvachev.
Gidrobiol Zh. 10(5), p31-35, 1974.

Descriptors: *Chlorides, Organic compounds, *Carp, *Absorption, *Metabolism, Water pollution effects, *Carbon, Carbonates, Fish behavior, *Inhibition.
Identifiers: Carbon-14, Glycogen, Triethyltin chloride, Inorganic carbon.

Triethyltin chloride (TETC) in a concentration of 0.01, 0.1 and 1 mg/l affected absorption of inorganic carbon (NaH14CO3) by (Cyprinus carpio) from the water environment and its incorporation into the metabolic processes. With 0.001 and 0.1 mg/l concentrations of TETC no noticeable deviations in fish behavior were observed for 40 days of the experiment, but changes were observed in 14C uptake by blood, white and red muscle, liver and brain. The most noticeable changes occurred in carbohydrate metabolism of the liver and brain. TETC inhibited de novo synthesis of glycogen in all the organs under study, the inhibition being especially sharp in the brain tissue.--Copyright 1975, Biological Abstracts, Inc.
W76-11732

THE EFFECT OF PESTICIDES ON THE QUALITY OF BODIES OF WATER, (IN RUSSIAN),
Institut Hygieny a Epidemiologie, Prague (Czechoslovakia). Dept. of General Public Hygiene.
Y. Pokorni, and K. Kulikova.
Gig Sanit. 1, p 89-91, 1974.

Descriptors: *Water quality, *Pesticide toxicity, Water pollution effects, *Pesticides, Water pollution control, *Toxicity, Water quality standards, *Lethal limit, Algae, Phytoplankton, Protozoa.
Identifiers: *Czechoslovakia.

Various types of pesticides, their influence on the quality of surface waters, and water pollution prevention measures are discussed. Studies were conducted at the Prague Institute (Czechoslovakia) to determine the influence of the pesticides on water organisms (algae, protozoa, phytoplankton and laboratory fish). The sensitivity of fish to different pesticides, their influences on the taste (taste to someone eating it) of the fish, as well as their toxicity were tested. It is necessary to determine the hygienic, allowed concentrations of pesticides in surface waters, in order to be able to devise the necessary sanitary measures.--Copyright 1975, Biological Abstracts, Inc.
W76-11733

FORECASTING THE DANGER OF ORGANIC COMPOUNDS IN THE ENVIRONMENT, (IN RUSSIAN),
S. D. Zaugol'nikov, M. M. Kochanov, M. M. Loit, and A. O. Stavchanskii.
Gig Sanit. 5, p 81-86, 1974.

Descriptors: *Forecasting, *Environment, *Organic compounds, *Toxicity, *Solubility, *Volatility, Water analysis, Air pollution, Regression analysis, Atmosphere, Lethal limit.
Identifiers: Nomograms, Boiling points(Organic compounds).

An analysis of the data on 43 substances in the air of industrial rooms, 30 substances in the atmosphere of populated areas and 26 substances in bodies of water established that the danger of their effect is determined not only by their toxicity but also to a considerable extent by their volatility and solubility. A method of approximate determinaton of the degree of real danger of chemical compounds was developed which is based on the dependence of the index of the degree of real danger on the boiling point of the substance and maximum allowable concentration, expressed as linear equations of multiple regression for industrial rooms, atmosphere of populated areas and bodies of water. For convenient practical use of the method, a nomogram is given by means of which the degree of real danger of a substance can be determined approximately if the boiling point of the substance and the maximum allowable concentration in the pertinent environment are known.--Copyright 1975, Biological Abstracts, Inc.
W76-11734

THE IMPORTANCE OF ZOOPLANKTON IN THE METABOLISM OF LAKE SCHIEREN, (IN GERMAN),
K. E. Nowak.
Arch Hydrobiol. 75(2), p 149-224, 1975.

Descriptors: *Zooplankton, Lakes, Europe, Algae, *Metabolism, Bacteria, Cycling nutrients, Minerology, Eutrophication, Seasonal, Phytoplankton.
Identifiers: *Lake Schieren(W Germany).

In the euproductive Schierensee (West Germany) zooplankton plays a decisive role in the breakdown and direct utilization of living algae, bacteria and zooplankton. The contribution of zooplankton to direct and indirect mineralization processes and recycling of nutrients makes it the driving force in the rapid metabolism of this particular lake. The typical clear water stage that occurs in many lakes in June is caused to some extent by lack of phosphate and other nutrients but also by the high bioactivity of zooplankton. In spring and early summer this bioactivity is nearly double that in autumn; this is due to poor utilization of the algae which dominate in autumn. In spring the assimilation of organic substances, mainly organisms, reaches a peak of 70-90% of the rate of primary production, and 50-60% only in autumn. Evidently there is a close correlation between quality and quantity of phytoplankton and the development and bioactivity of zooplankton.--Copyright 1975, Biological Abstracts, Inc.
W76-11735

INTERACTION OF BLUE-GREEN ALGAE WITH MULTIPLY-CHARGED INORGANIC CATIONS, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Inst. of Colloidal Chemistry and Water.
For primary bibliographic entry see Field 5A.
W76-11736

CHARACTERISTICS AND PRODUCTION POTENTIALS OF ZOOPLANKTON FROM LAKE SHCHELKUN IN THE MIDDLE URALS, (IN RUSSIAN),
Ural and Siberian Fishery Scientific-Research and Planning Inst., Sverdlovsk (USSR).
I. V. Kozlova.
Gidrobiol Zh. 10(3), p 31-38, 1974.

Descriptors: *Zooplankton, Lakes, *Biomass, Vegetation, Ice, *Productivity.
Identifiers: *Bosmina-Longirostris, Russian-SFSR, Urals, *Lake Shchelkun(USSR).

Zooplankton development dynamics in Lake Shchelkun (Russian SFSR, USSR) and its connections with the hydrometrological conditions and elevation in the water level are given for the period from Feb., 1969-Feb., 1972. The main zooplankton complex remains constant in spite of the total biomass fluctuations within wide limits (0.56-6.23 g/m3 in the vegetation period, 0.001-0.22 g/m3-under ice). Data are presented on the biology of some mass zooplankton species. The bulk of production of foor zooplankton in the vegetation period of 1971 was formed in Aug.-Sept., when Bosmina longirostris dominated the plankton.--Copyright 1975, Biological Abstracts, Inc.
W76-11737

THE LAKE TEXCOCO (MEXICO) SEDIMENTS AND THEIR CAPACITY TO SUPPORT VEGETATION, (IN FRENCH),
Toulouse-3 Univ. (France).
For primary bibliographic entry see Field 2J.
W76-11738

PHYTOPLANKTON, PRODUCTION AND BREAKDOWN OF ORGANIC MATTER IN THE KUIBYSHEV RESERVOIR, (IN RUSSIAN),
Akademiya Nauk SSSR, Tolyatti. Institut Biologii Vnutrennykh Vod.
A. B. Ivantin.
Gidrobiol Zh. 10(3), p 65-69, 1974.

Descriptors: *Phytoplankton, Productivity, *Organic matter, Reservoirs, *Decomposing organic matter, *Primary productivity, Photosynthesis.
Identifiers: Russian-SFSR, Kuibyshev Reservoir(USSR).

On the basis of observations at 14 stations in the Kuibyshev Reservoir on the Volga (Russian SFSR, USSR) between May-Oct. 1971 data are presented on mean daily production of phytoplankton, decomposition of organic matter and intensity of photosynthesis in the trophogenic layer of water. Regardless of the level of organic matter production in the reservoir, decomposition usually exceeded primary production by 2-3 times.--Copyright 1975, Biological Abstracts, Inc.
W76-11739

ON THE PROROCENTRUM RED TIDE OCCURRED IN THE COASTAL WATERS OF TOYOURA, FUNKA BAY, HOKKAIDO, IN SEPTEMBER, 1973, (IN JAPANESE),
A. Iizuka, and S. Komaki.
Bull Hokkaido Reg Fish Res Lab. 40, p 60-66, 1974.

Descriptors: *Red Tide, Plankton, *Dinoflagellates, Bays, Metabolism, Dissolved oxygen, Salinity, Water pollution effects.
Identifiers: Coastal waters, Halocline, Hokkaido, *Japan(Funka Bay), *Prorocentrum, Prorocentrum-micans, Scallop, Toyoura.

Prorocentrum, Dinoflagellata has often occurred as red tide plankton in polluted inland waters of Honshu, but in Hokkaido (Japan) the red tide species was rarely seen until 1972. In Sept. 1973 the 1st occurrence of the red tide, composed of the monotonic species, P. micans Ehrenberg, was observed in the coastal waters of Toyoura and its adjacent area, Funka Bay, Hokkaido. In coastal waters with a depth of 15-20 m, the surface water to about 0.5 m had a low salinity of 25.06-29.59%, and at the greater depths, 30.00-33.67%, therefore a sharp halocline was found between 0.5-1 m. Near the red tide, dissolved O2(DO) reaches 160-168%, and chemical O2 demand (COD) of dissolved matter reaches 2.6-5.8 mg/l. The increase in DO COD in the sea water seemed to be caused by active metabolism of the red tide species. Damage of the scallop cultivated in this area was not found in spits of the relatively long duration of the red tide.--Copyright 1975, Biological Abstracts, Inc.
W76-11740

NITROGEN CYCLING IN MICROCOSMS AND APPLICATION TO THE BIOLOGY OF THE NORTHERN ARM OF THE GREAT SALT LAKE,
Utah State University, Logan Dept of Biology
J. C. Stube, J. Post, and D. B. Porcella
Available from the National Technical Information Service, Springfield Va 22161, as PB-257 063, $5.00 in paper copy, $3.00 in microfiche. Utah Water Research Laboratory Logan. Publication PRJSBA-016-1, 77 p, June 1976. 43 fig, 28 tab, 111 ref, 3 append. OWRT A-024-UTAH(2), 14-34-0001-6046.

Descriptors: *Nitrogen compound, *Nitrogen cycle, Water pollution sources, Water pollution, Waste water(Pollution), *Halophilic animals, *Halophytes, Algae, Denitrification, *Utah, *Saline, lake, Organic matter, Brine shrimp, Nitrogen fixation, Nitrate, Nitrites, Bacteria, Ammonia, Nutrients, *Cycling nutrients.
Identifiers: *Great Salt Lake(Utah), Halobacterium, Halococcus, Dunaliella salina, D. viridis, Artemia salina, Ephydra gracilis, E. Hians, Brine fly.

Nitrogen cycling was studied in the hypersaline north arm of the Great Salt Lake. The lake, particularly the north arm, has a massive accumulation of organic matter from at least 10 cycles in the last 100,000 years from a freshwater to a saline lake, plus the influence of human industry and agriculture in more recent times. The north arm planktonic and attached community consists of principally, in order of biomass: bacteria of at least two genera, Halobacterium and Halococcus; two algae, Dunaliella salina and D. viridis; the brine shrimp, Artemia salina; and, two species of brine fly, Ephydra gracilis and E. hians an possibly one more species. The nitrogen cycle was studied using weekly lake samples and sediment-water microcosms. Result from the lake samples indicated a high level of organic nitrogen as well as undetectable amounts of nitrate, nitrite, and nitrogen fixation. Ammonia was the only detectable inorganic nitrogen form and occured in the lake only at times of low algal activity or high excretion rates by the invertebrates or high bacterial activity. Microcosm studies demonstrated that ammonia, nitrate and urea did not stimulate the bacteria directly but did so indirectly through increased algal activity. Glutamic acid, an organic form of nitrogen, stimulated the bacteria directly. No nitrification was observed in the microcosms although nitrate is observed when the microcosms were fed nitrate (denitrification). A preliminary model of various interaction is presented and some aspects of the various organisms and their metabolism are discussed.
W76-11778

MARINE STUDIES OF SAN PEDRO BAY, CALIFORNIA. PART III. THERMAL TOLERANCE AND SEDIMENT TOXICITY STUDIES,
University of Southern California, Los Angeles
Allan Hancock Foundation.
Available from the National Technical Information Service, Springfield, Va 22161, as COM-74-11120, $5.50 in paper copy, $3.00 in microfiche. Southern California University Sea Grant Program, Report USC-SG-1-74, February 1974, 110 p. D. F. Soule and M. Oguri (Eds.). SG-04-3-158-45.

Descriptors: Aquatic animals, *Benthos, *Toxicity, *Sediments, Survival, Reproduction, Annelida, Mollusca, Gastropoda, Harbors, Upwelling, Ocean currents, Intertidal zone, *California, *Thermal pollution, Water temperature, Mexico, *Marine animals, Bays.
Identifiers: *San Pedro Bay(Calif), *Dredge spoil, Los Angeles Harbor(Calif), Polychaetes, Engraulis mordax, Anchovy, Capitella capitata, Neanthes arenaceodentata, Littorina planaxis, Littorina scutulata, LNG conversion plant, Baja California, Current patterns, Cold water effluents.

is is the third in a series of marine studies of San dro Bay, California. Emphasis is on thermal lerance and sediment toxicity studies. The six udies are titled: Thermal effects and San Pedro y, D. F. Soule; Preliminary observations on the wer minimum temperature requirements of the rthern Anchovy, G. Brewer; Effects of subnor- l temperatures on some common Los Angeles rbor animals, E. A. Norse; The effect of vari- s water temperatures on the survival and roduction in polychaetous annelids: Prelimina- Report, P. Oshida and D. J. Reish; Tolerance of torina planaxis and L. scutulata to temperature nges (Mollusca, Gastropoda), D. Hadley and Straughan; and, Preliminary investigations of effects of resuspended sediment on two spe- s of benthic polychaetes from Los Angeles Har- , R. R. Emerson. (See also W74-05708; W75- 72; W75-03176; and W75-06245) (See W76- 94 thru W76-11799) (NOAA)
6-11793

ERMAL EFFECTS AND SAN PEDRO BAY,
versity of Southern California, Los Angeles.
n Hancock Foundation.
. Soule.
Marine Studies of San Pedro Bay, California. III. Thermal Tolerance and Sediment Toxicity dies. University of Southern California, Los eles. USC-SG-1-74, p 1-20, 6 fig, 40 ref. ruary, 1974.

criptors: *California, *Marine animals, oling water, *Water currents, *Water tempera- , *Thermal pollution, Industrial wastes, Ther- stress, Aquatic environment, Biota, hodology, Reviews.
tifiers: *Cool water, *Cool temperate biota, Pedro Bay(Calif), Liquid natural gas conver- plant, *Thermal tolerance, Low temperature emes, Los Angeles Harbor(Calif), Cold water ents.

ummary of thermal effects research is ented in relationship to local considerations of posed cold water effluent from a liquid natu- as conversion plant. Criteria for evaluating ef- are discussed. Local, regional, and Pacific coast current patterns and thermal regimes ompared, and the potential for recolonization cool-temperate biota is examined. The osed cold water effluent might mimic areas of elling along the coast of southern and Baja rnia, where such biota have been recorded. also W76-11793) (Katz)
11794

LIMINARY OBSERVATIONS ON THE ER MINIMUM TEMPERATURE UIREMENTS OF THE NORTHERN HOVY,
ersity of Southern California, Los Angeles.
Hancock Foundation.
ewer.
arine Studies of San Pedro Bay, California, II. Thermal Tolerance and Sediment Toxicity es, University of Southern California, Los es. USC-SG-1-74, February, 1974. p 21-43, 3 fig, 28 ref.

iptors: *Marine fish, *Marine animals, ing water, *Biota, *Fish behavior, ssay, *Fish eggs, Industrial effluents, Ther- ress, Aquatic environment, Methodology, temperature, Cold-water fish, Fish uction, *Thermal pollution, California.
iers: *Temperature selection, erature tolerance, Lower minimum tem- re requirements, *Northern anchovy, En- mordax, Los Angeles Harbor, Anchovy Juvenile anchovies, Temperature ence, Temperature avoidance.

dy of the lower minimum temperature ments of the northern anchovy, Engraulis , was made. Juvenile anchovies held for a minimum of two weeks at acclimation temperatures of 19.5 degrees, 16.0 degrees, and 12.0 degrees were subjected to various degrees of thermal stress from 17.0 degrees to 7.0C. A lower lethal temperature of approximately 7.0C was estimated from two experimental procedures. Anchovy eggs were held at incubation temperatures between 9.0 degrees and 15.0C. At incubation temperatures below 10.0C, complete yolk absorption and starvation occurred in larvae before development of pigmented eyes and a functional jaw was completed. Behavior of juvenile ancovies in a 2.3 m horizontal thermal gradient with a temperature differential of 5.0C indicated significant selection of the warmest water available to the fish at experimental temperatures between 13.0 degrees and 25.0C. Anchovies actively avoided temperatures above 25.0C. (See also W76-11793) (Katz)
W76-11795

EFFECTS OF SUB-NORMAL TEMPERATURES ON SOME COMMON LOS ANGELES HARBOR ANIMALS,
University of Southern California, Los Angeles. Allan Hancock Foundation.
E. A. Norse.
In: Marine Studies of San Pedro Bay, California, Part III. Thermal Tolerance and Sediment Toxicity Studies, University of Southern California, Los Angeles. USC-SG-1-74, February, 1974. p 44-62, 3 tab, 1 fig, 16 ref.

Descriptors: Invertebrates, *Mollusks, *Mussels, *Crustaceans, *Crabs, Benthic fauna, Marine fish, *Bioassay, Cooling water, Methodology, *Water temperature, Physiology, Reproduction, Breeding, Sexual maturity, Harbors, *Mortality, *Thermal pollution, California.
Identifiers: *Coelenterates, *Arthropods, *Mytilus edulis, Pachygrapsus, Tisbe, Cladonema, Zoeal larvae, Medusae, Copepodite, Temperature tolerance, Lower minimum temperature, Sublethal effects, Swimming ability, Byssus thread formation, Reproductive rates, Subnormal temperatures, *Los Angeles Harbor(Calif).

Four species of animals belonging to three phyla (Coelenterata, Mollusca and Arthropoda) were tested to demonstrate effects of lowered temperatures. Adult Mytilus edulis and zoeal larvae of Pachygrapsus crassipes were acclimated at 21C; medusae of Cladonema sp. were acclimated at 17C, and adult and late copepodite stages of Tisbe sp. were acclimated at 21, 17, 13, and 9C. Animals were then transferred to 21, 17, 13, 9, or 5C for 24 hours. Significant mortalities occurred in 19.2% of Tisbe sp. acclimated at 21C, and 100.0% of Cladonema sp. acclimated at 17C died when transferred to 5C. (See also W76-11793) (Katz)
W76-11796

THE EFFECT OF VARIOUS WATER TEMPERATURES ON THE SURVIVAL AND REPRODUCTION IN POLYCHAETOUS ANNELIDS: PRELIMINARY REPORT,
California State Univ., Long Beach. Dept. of Biology.
P. Oshida, and D. J. Reish.
In: Marine Studies of San Pedro Bay, California, Part III. Thermal Tolerance and Sediment Toxicity Studies, University of Southern California, Los Angeles. USC-SG-1-74, February, 1974. p 63-77, 3 tab, 24 ref.

Descriptors: Water quality, *Bioassay, *Benthic organisms, Benthos, *Mortality, *Water temperature, Marine animals, Laboratory study, Aquatic environment, Thermal stress, Reproduction, Feeding rates, *Annelids, Cooling water, *Thermal pollution, California.
Identifiers: *Polychaetous annelids, Capitella capitata, Neanthes arenaceodentata, Minimum temperature, Maximum temperature.

The effects of varying water temperatures, namely 5, 9, 13, 17, 23, 26, 29, 32, and 35C, on survival, feeding, and reproduction were studied on three laboratory inbred species of polychaetous annelids. Laboratory procedures were outlined for both short term and long term experiments; the preliminary data were presented for Capitella capitata and Neanthes arenaceodentata. The maximum and minimum 28 day TLm values were 7.8 and 26.6C for Capitella capitata and 12.3 and 24.6C for Neanthes arenaceodentata. (See also W76-11793) (Katz)
W76-11797

TOLERANCE OF LITTORINA PLANAXIS AND LITTORINA SCUTULATA TO TEMPERATURE CHANGES,
University of Southern California, Los Angeles. Allan Hancock Foundation.
D. Hadley, and D. Straughan.
In: Marine Studies of San Pedro Bay, California, Part III. Thermal Tolerance and Sediment Toxicity Studies, University of Southern California, Los Angeles. USC-SG-1-74, February, 1974. p 78-96, 9 tab, 5 ref.

Descriptors: *Bioassay, *Thermal stress, Behavior, Benthic organisms, Benthos, Mollusks, Gastropods, *Water temperature, Intertidal areas, Thermal pollution, *Snails, Growth rates, California.
Identifiers: *Intertidal snails, Littorina, Attachment rate, Oxygen consumption.

This survey was conducted primarily to consider the effects of reduced water temperature on two intertidal snails, Littorina planaxis and L. scutulata. The parameters considered included mortality, attachment of animals to the substrate, size of animals, and season of the year. Additional experiments were conducted on elevated temperatures to consider whether the animals respond merely to temperature change itself, or whether the direction of temperature change is important. Within the range of 6C to 29C the response appears to be seasonal and size dependent in L. planaxis. Littorina scutulata is more tolerant of 6C than 29C. No mortality was recorded at 6C while mortality was recorded in both species at 29C. The rate of attachment was influenced by temperature in both species. This is important, because unattached animals are readily washed away from the population. Littorina scutulata had a higher attachment rate than L. planaxis at 6C. When both species are subjected to a 12C drop in temperature, there is often a short period when attachment rate is low so that the intermittent exposure to such changes could result in a gradual loss of animals through wave action during such periods. (See also W76-11793) (Katz)
W76-11798

PRELIMINARY INVESTIGATIONS OF THE EFFECTS OF RESUSPENDED SEDIMENT ON TWO SPECIES OF BENTHIC POLYCHAETES FROM LOS ANGELES, HARBOR,
University of Southern California, Los Angeles. Allan Hancock Foundation.
R. R. Emerson.
In: Marine Studies of San Pedro Bay, California, Part III. Thermal Tolerance and Sediment Toxicity Studies, University of Southern California, Los Angeles. USC-SG-1-74, February, 1974, pp 97-110, 2 tab, 3 fig, 5 ref.

Descriptors: *Annelids, *Toxicity, *Mortality, *Bioassay, Laboratory animals, *Reproduction, *Productivity, Biota, Laboratory studies, *Sediments, Spoil banks, Benthos, *Suspended solids, Harbors, California.
Identifiers: *Polychaetes, *Toxic elutriates, Capitella capitata, Larvae, Trochophores, Metatrochs, Ophryotrocha, Resuspended sediments, Sea fertilizer, *Los Angeles Harbor(Calif).

Ophryotrocha nr. labronica and Capitella capitata were used as bioassay organisms to determine the toxicity of resuspended sediment from Los Angeles Harbor. Sediment was collected from four stations representing a range of polluted conditions. A test solution or 'standard elutriate' was prepared according to EPA guidelines. An additional series of dilutions and concentrations were prepared to produce a range of toxic elutriates. Mortality of Capitella capitata trochophores and metatrochs was less than 50% in all short term 96 hour exposures. Long term (28 day) exposures were unsuccessful. Ophryotrocha did not undergo any mortality during a short term 96 hour exposure. Long term (28 day) exposure decreased reproductivity at high concentrations of resuspended sediment. Lower concentrations of resuspended sediment produced a stimulatory effect on reproduction. Preliminary evidence suggests that harbor dredge spoils may have potential role as a 'sea fertilizer' which could be distributed in specified areas to improve the productivity of the marine environment. (See also W76-11793) (Katz)
W76-11799

EVALUATION OF STREAM CHANNELIZATION AND MITIGATION ON THE FISHERY RESOURCES OF THE ST. REGIS RIVER, MONTANA,
Montana Cooperative Fishery Unit, Bozeman.
For primary bibliographic entry see Field 4C.
W76-11800

CAESIUM-137: ITS ACCUMULATION IN A LITTORAL COMMUNITY,
University of Manchester Inst. of Science and Technology (England). Pollution Research Unit.
M. J. Broom, P. D. Grimwood, and E. G. Bellinger.
Marine Pollution Bulletin, Vol. 6(2), 1975, p. 24-26, 2 tab., 1 fig., 21 ref.

Descriptors: *Cesium, *Radioactive waste disposal, *Demersal fish, *Commercial fish, *Marine fish, *Mussels, *Marine algae, Radioactive wastes, Radioecology, Radioisotopes, Marine animals, Mollusks, Aquatic plants, *Littoral, *Putassium, Path of pollutants, Water pollution effects.
Identifiers: *Windscale, *Caesium-137, *Irish Sea.

The low-level radioactive liquid wastes which arise at the U. K. nuclear fuel reprocessing plant at Windscale on the Cumbria coast are discharged into the Irish Sea. These wastes are initially dispersed but they can also become reconcentrated in marine organisms. Concentrations of 137-Cs relative to those of potassium in the various stages of marine food chains are described, discrimination occurs in favor of 137-Cs over potassium during the transfer between the different trophic levels. (Katz)
W76-11808

FIN EROSION IN WINTER FLOUNDER,
National Marine Fisheries Service, Highlands, N. J. Sandy Hook Sport Fisheries Marine Lab.
J. Ziskowski, and R. Murchellano.
Marine Pollution Bulletin, Vol. 6(2), 1975, p. 26-29, 1 tab, 3 fig, 9 ref.

Descriptors: *Marine fish, *Atlantic Ocean, *Fish diseases, Animal pathology, *Bottom fish, *Demersol fish, Commercial fish, Environmental effects, Fish physiology, Fish populations, *Epizootiology, Estuarine environment, Bays, On-site investigations, *New Jersey, Bays, Water pollution effects.
Identifiers: *New York Bight, *Great Bay(NJ), *Sandy Hook-Raritan Bay(NJ), *Fin erosion, *Winter flounders.

Diseased fish showing erosion of the fins have been recorded from polluted waters in several parts of the world. Results of a year's survey of fin erosion among fish in oceanic and estuarine waters of New York Bight are presented. The pristine Great Bay was chosen as a control for the heavily contaminated Sandy Hook-Raritan Bay system. Almost all fin erosion was confined to demersal flat fish, particularly the winter flounder, a species which spends a long time in polluted estuaries near Sandy Hook. (Katz)
W76-11809

INCIDENCE OF POLYCHLORINATED BIPHENYLS IN CLYDE SEAWEED,
Leeds Univ. (England). Wellcome Marine Lab.
J. G. Parker, and F. Wilson.
Marine Pollution Bulletin, Vol. 6(3), 1975, p. 46-47, 1 tab., 1 fig., 14 ref.

Descriptors: *Polychlorinated biphenyls, *Chlorinated hydrocarbon pesticides, *Aquatic plants, Storage, Water pollution effects, *Marine algae, *Kelp, Rooted aquatic plants.
Identifiers: *Seaweed, *Firth of Clyde, Clyde estuary, Pelvetia, Fucus, Ascophylla.

PCBs accumulate in seaweeds. This survey of concentrations found in fixed algae around the Firth of Clyde reveals a similar pattern of PCB distribution to that found in mussels. (Katz)
W76-11810

EUTROPHICATION OF A PARTIALLY ENCLOSED ESTUARINE MUDFLAT,
National Inst. for Physical Planning and Construction Research, Dublin (Ireland).
E. Fahy, R. Goodwillie, J. Rochford, and D. Kelley.
Marine Pollution Bulletin, Vol. 6(2), 1975, p 29-31, 3 fig, 13 ref.

Descriptors: *Estuarine environment, *Bays, *Waterfowl, *Eutrophication, *Nutrients, *Tidal marshes, Intertidal areas, Water birds, Wildlife, Water pollution effects, Nitrogen, Phosphorous, Potassium, Distribution.
Identifiers: *Spartina, Biological mapping, *Dublin, *Ireland, *Rogerstown estuary(Ireland).

Some 130 years ago, a small estuary to the north of Dublin was partly cut off from the sea by a railway causeway. The mudflats that formed became an important feeding ground for wildfowl. In recent years the estuary has become subject to increasing organic pollution. Algal growth has increased and while the situation is not yet damaging to wildfowl, there is evidence that further increase in nutrients would cause undesirable extension of algal mats in the estuary. (Katz)
W76-11811

EFFECTS OF CRUDE OIL ON CORALS,
Pennsylvania State Univ., University Park.
A. A. Reimer.
Marine Pollution Bulletin, Vol. 6(3), 1975, p 39-43, 3 tab, 3 fig, 14 ref.

Descriptors: Oil, *Oil pollution, *Coral, *Reefs, *Toxicity, *Bioassays, Behavior, Animal behavior, Invertebrates, Atolls, Tropical regions, Aquatic habitat, Environmental effects, Mortality, Food habits, Water pollution effects.
Identifiers: *Reef communities, *Crude oil, Reef metabolism, Panamanian coral species, Crude oil, Bunker-C oil, Marine diesel oil, *Feeding response.

Corals are key members of the tropical reef communities, by providing habitat for other organisms and entering importantly into the overall metabolism of the reef community. Concern has been expressed several times at the collapse of the community that would result from damage to corals by oil pollution. So far relatively few experimental studies of the susceptibility of coral to oil have been carried out. In this study four Panamanian coral species have been exposed to marine diesel and bunker oil. These may cause delayed death, but probably more importantly interfere with feeding and metabolism at sub lethal concentrations. (Katz)
W76-11812

AROMATIC HYDROCARBONS AND THE GROWTH OF MARINE ALGAE,
Glasgow Univ. (Scotland). Dept. of Botany
A. D. Boney.
Marine Pollution Bulletin, Vol. 5, (12), 1974, p 185-186, 3 tab, 5 ref.

Descriptors: *Mortality, *Organic compounds, *Pathology, *Plant pathology, Toxicity, *Marine algae, *Marine sediments, Water pollution effects, *Aromatic compounds.
Identifiers: *Aromatic hydrocarbons, *Cancerous growths, *3,4-benzpyrene, *20-Methyl cholanthrene, *Carcinogens, *Carcinogenic activity, Tumor-like proliferations.

Aromatic compounds isolated from marine muds cause cancerous growths in certain seaweeds. In this study a number of aromatic hydrocarbons including some which are not yet reported as having carcinogenic activity have been found to stimulate growth of algae. (Katz)
W76-11813

EFFECTS OF PETROLEUM ON ESTUARINE BACTERIA,
Maryland Univ., College Park. Dept. of Microbiology.
J. D. Walker, P. A. Seesman, and R. R. Colwell.
Marine Pollution Bulletin, Vol. 5(12), 1974, p 186-188, 1 tab, 3 fig, 6 ref.

Descriptors: *Oil pollution, *Estuaries, Aquatic microorganisms, *Marine bacteria, *Marine fungi, *Marine algae, *Chesapeake Bay, Oil spills, Estuarine environment, Growth rates, Marshes.
Identifiers: *Filamentous fungi, *Achlorophyllous algae, *Proteolytic bacteria, *Lipolytic bacteria, Fuel oil no 2, Louisiana crude oil, *Chitinolytic bacteria.

The effects of petroleum on the natural microbial flora of a given environment, that is, on the bacteria, yeasts, filamentous fungi, and achlorophyllous algae, have largely been ignored. The first recorded investigation of the impact of petroleum on ecologically important groups of bacteria is presented. (Katz)
W76-11814

INTERTIDAL ORGANISMS OF AN INDUSTRIALIZED ESTUARY,
Paisley Coll. of Technology (Scotland). Dept. of Biology.
J. C. Smyth, D. J. Curtis, I. Gibson, and M. Wilkinson.
Marine Pollution Bulletin, Vol. 5(12), 1974, p 189-191, 1 tab, 4 fig, 13 ref.

Descriptors: *Estuaries, *Estuarine environment, *Beaches, *Mudflats, *Wading birds, Water pollution effects, *Annelids, *Oligochaetes, *Molluscs, *Crustaceans, Intertidal areas, Shores, Terrestria habitat, *Aquatic birds, Wildlife, Ducks(Wild), Marine plants.
Identifiers: *Glasgow, Firth of Clyde, Redshank, Black Headed Gulls, *Clyde estuary, *Bird feeding areas.

A study of the intertidal organisms of the Clyde Estuary is being undertaken to assess the effect of changing levels of pollution and to relate t these and other changes the distribution of impo tant winter flocks of waders and ducks. (Katz)
W76-11815

DIFFERENTIAL SENSITIVITY TO PCB B PHYTOPLANKTON,
Florida State Univ., Tallahassee. Marine Lab.

A. Moore, Jr., and R. C. Harriss.
arine Pollution Bulletin, Vol. 5(11), 1974, p 174-
6, 12 ref.

escriptors: *Polychlorinated biphenyls, oxicity, *Nannoplankton, *Estuarine environ-nt, *Phytoplankton, Mortality, Bioassay, uatic algae, Aquatic plants, Aquatic productivi- Marine plants, Primary productivity, Water llution effects.
ntifiers: Differential sensitivity, Aroclor 1242.

tural, mixed phytoplankton communities are re sensitive to PCBs than pure or mixed labora- y cultures. Further, nannoplankton is generally itted from consideration although this fraction tributes the bulk of production by the toplankton community. This study is the first mpt to evaluate the differential sensitivity to 3 by an estuarine phytoplankton community. trary to expectation, the greatest sensitivity to 3 is found in net-plankton not in nannoplank- The susceptibility of phytoplankton to PCBs ghly variable within a community and this may e important implications for selective plankton lers. (Katz)
5-11816

LUTION OF HONG KONG'S COMMER- L OYSTER BEDS,
g Kong Univ. Dept. of Zoology.
lorton.
ne Pollution Bulletin, Vol. 6(8), 1975, p. 117-
3 tab, 3 fig, 17 ref.

riptors: *Aquiculture, *Oysters, nmercial shellfish, *Public health, iforms, Water pollution effects, Sewage bac- Water quality, Water pollution sources.
ifiers: *Crassostrea gigas, Deep bay oyster try, *Hong Kong, *Commercial oyster beds, er purification.

ers are cultivated in Hong Kong by a primi- nethod of bottom laying in polluted waters. nethod of shucking the oysters is also unhy- . The oysters are faecally contaminated, par- rly in the summer months when the rain- g south-east monsoon flushes out the rivers, ns and watercourses (drains) into the oyster cing areas. The level of contamination is nd largely comprises effluents derived from eighboring agricultural areas of Hong Kong outhern China. Cleansing of the oysters, o resale, particularly in summer, is urgently mended, possibly using ultraviolet light as a sary exercise in public health. But an ulti- olution to the problem lies in the longer term nization of the industry. (Katz)
1817

RTIDAL FAUNA OF THE INDUSTRIAL- FORTH ESTUARY,
g Univ. (Scotland). Dept. of Biology.
Lusky, D. Bryant, M. Elliott, M. Teare, and ffot.
Pollution Bulletin, Vol. 7(3), 1976, p. 48-51, 0 ref.

otors: *Beaches, *Estuaries, *Mudflats, In- l effluents, Domestic effluents, *Water *Clams, *Annelids, *Oligochaetes, Inter- areas, Aquatic habitats, Invertebrates, organics, Wading birds, Waterfowl, Mol- Mussels, Water pollution effects.
ers: *Firth of Forth, Hydrobia, Macoma , Nereis diversicola, Nephthys hombergi, la marina, Mytilus edulis, Mya.

uarine Firth of Forth on the East Coast of d receives a considerable volume of indus- l domestic effluent. The status of intertidal rates and their bird predators is described.

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POLYSTYRENE SPHERULES IN THE SEVERN ESTUARY-A PROGRESS REPORT,
Bath Univ. (England). School of Biological Sciences.
For primary bibliographic entry see Field 5B.
W76-11819

INFLUENCE OF OIL ON NUCLEIC ACIDS OF ALGAE,
Institute of Biology of the Southern Seas, Sevastopol (USSR).
I. A. Daravin, O. G. Mironov, and I. M. Tsimbal.
Marine Pollution Bulletin, Vol 6(1), 1975, p. 13-14, 6 tab., 10 ref.

Descriptors: *Oil pollution, *Oily water, *Oil spills, *Algae, Biochemistry, *Enzymes, *Metabolism, Energy conversion, Plant physiology, Plant growth, Regulations, Environmental effects, Plant pathology, Toxicity.
Identifiers: *Black Sea, *Petroleum hydrocarbons, Sub-lethal effects, DNA, RNA, Nucleic acids.

There is a fair amount of knowledge on the grosser effects of petroleum hydrocarbons on organisms, more subtle effects are still poorly known. This is particularly true of their influence on biologically active compounds. Studies on the effect of oil on DNA and RNA of some Black Sea algae suggest that it inhibits biosynthesis of these compounds and modifies the degree of polymerization of deoxyribonucleic acids. (Katz)
W76-11821

ELIMINATION OF HYDROCARBONS BY MUSSELS,
Instituto di Biologia del Mare, Venice (Italy).
V. U. Fossato.
Marine Pollution Bulletin, Vol. 6(1), 1975, p. 7-10, 1 tab., 2 fig., 17 ref.

Descriptors: *Oil pollution, *Oil spills, *Oily water, *Mussels, Biochemistry, *Degradation, Mollusks, Mytilus, Water pollution effects, Pathology, Environmental effects, Metabolism, Mode of action, Temperature.
Identifiers: *Hydrocarbon elimination, *Lagoon of Venice(Italy), Biological half-life, Aliphatic hydrocarbons, Mytilus galloprovincialis.

Mussels collected from hydrocarbon polluted areas of the Lagoon of Venice were transferred to the relatively unpolluted port entrance of Malamocco. Hydrocarbon elimination was quite rapid in the first 10-15 days but then slow and incomplete: 12% of the initial content persisted in the tissues for 8 weeks. Elimination of hydrocarbons was almost independent of water temperature between 7.5-26.00C but virtually ceased in one lot when the temperature abruptly dropped from about 11C to 4.5-6.0C. The biological half-life of hydrocarbons in the mussels was calculated to be a little over 3-1/2 days, but this relates only to the initial rapid phase of elimination. (Katz)
W76-11822

TEMPERATURE AND THE SEASONAL AND GEOGRAPHICAL OCCURRENCE OF OILED BIRDS ON WEST EUROPEAN BEACHES,
Aberdeen Univ. (Scotland). Seabird Group.
W. R. P. Bourne, and C. J. Bibby.
Marine Pollution Bulletin, Vol. 6(5), 1975, p. 77-80, 2 tab., 2 fig., 54 ref.

Descriptors: Environmental effects, *Mortality, *Oil-water interface, *Shore birds, *Aicides, *Seashores, *Coasts, Oil pollution, Oily water, Oil spills, Mortality, Water pollution effects, Non-game birds, Water birds, Gulls, Waterfowl, Wildlife, *Water temperature, Atlantic Ocean, Mediterranean Sea, *Seasonal.
Identifiers: *Oiled birds, Cold water temperatures, Tar balls, Solid residues, *Beached bird surveys.

Oiled birds appear to be a commoner aspect of oil pollution where it occurs with cold water temperatures, whereas the formation of tar-balls becomes more prominent with warm ones, possibly because liquid oil becomes reduced to inert solid residue comparatively harmless to birds more rapidly at higher temperatures. (Katz)
W76-11823

EFFECTIVENESS AND TOXICITY OF AN OIL DISPERSANT IN LARGE OUTDOOR SALT WATER TANKS,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia).
P. G. Wells, and P. D. Keizer.
Marine Pollution Bulletin, Vol. 6(10): 1975, p. 153-157, 3 tab., 2 fig., 18 ref.

Descriptors: *Oil spills, *Toxicity, *Bioassays, *Methodology, *Benthos, *Weathering, *Aging(Physical), Behavior, Oil pollution, Laboratory methods, Water pollution effects.
Identifiers: *Oil dispersant, *Oilsperse 43, *Venezuelan crude oil, *Green sea urchins, Weathered crude oil.

Use of the dispersant, Oilsperse 43, increased the dispersion of Venezuelan Guanipa crude oil. The resulting mixture was more homogeneous and the oil slick less viscous than in the oil tank. The dispersant appeared to retard formation of the familiar 'crust' on the surface. A weathered crude oil plus dispersant mixture with an oil concentration of 250 micrograms/l was lethal to over 50% of the test organisms, green sea urchins within 4 days. No mortalities occurred among urchins exposed to the crude oil treatment. (Katz)
W76-11824

A MODEL OF PATCHINESS FOR PREY-PREDATOR PLANKTON POPULATIONS,
Liege Univ. (Belgium) Institut of Mathematique.
D. M. Dubois.
Ecological Modelling (International Journal on Ecological Modelling and Engineering and Systems Ecology), Vol. 1, No. 1, p 67-80, May 1975. 3 fig, 22 ref.

Descriptors: *Aquatic environment, *Plankton, *Ecology, Mathematical models, Advection, Simulation analysis, Equations, Systems analysis, Aquatic populations.
Identifiers: *Ecological systems, *Spatial structuration, Nonlinear model, Turbulent sea, Ecological waves, Partial differential equation, Prey-predator populations.

A nonlinear model is proposed to explain the horizontal structuration of prey-predator populations in a turbulent sea. The model is represented by a system of partial differential equations taking into account advection, due to residual currents, and eddy diffusivity. The ecological interactions are assumed to be of the Lotka-Volterra type. Starting from an initial small patch of prey-predator populations, numerical simulations show two distinct phases: (1) an 'explosive' phase corresponding to a bloom of phytoplankton and, after that, (2) a decrease of the quantity of plankton at the center of the patch leading to a ring structure. The ring propagates in increasing its radius with constant intensity and velocity. The prey behaves like an 'activator' and the predator like an 'inhibitor'. The ring is thus similar to an active wave. When two waves meet each other, the simulation shows their 'annihilation'. All these new properties of the prey-predator equations are in agreement with experimental data. Finally, the physical mechanism for initiation of patchiness is discussed. (Bell-Cornell)
W76-11878

A BOUNDARY VALUE APPROACH FOR ESTUARINE WATER QUALITY MODELLING

WITH RESULTS FOR JAMAICA BAY, NEW YORK,
Texas Univ. at Austin. Dept. of Electrical Engineering.
For primary bibliographic entry see Field 5B.
W76-11881

SOME ASPECTS OF MODELLING THE LONG-TERM BEHAVIOUR OF AQUATIC ECOSYSTEMS,
Technical Univ. of Denmark, Lyngby. Inst. of Mathematical Statistics and Operations Research.
For primary bibliographic entry see Field 5B.
W76-11883

PLASTIC PARTICLES IN SURFACE WATERS OF THE NORTHWESTERN ATLANTIC,
National Marine Fisheries Service, Narragansett, R.I. Narragansett Lab.
For primary bibliographic entry see Field 5B.
W76-11889

THE ROLE OF BENTHIC METABOLISM IN A BOG LAKE,
Connecticut Univ., Storrs. Inst. of Water Resources.
P. H. Rich.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-257 151, $3.50 in paper copy, $3.00 in microfiche. Completion Report, July 1976. 5 p, 1 fig, 5 ref. OWRT A-054-CONN (2) 14-31-0001-4007.

Descriptors: Eutrophication, Water pollution effects, *Lakes, *Lake sediments, *Metabolism, *Detritus, *Carbon cycle, Nutrients, *Trophic level, Ecosystems, Hypolimnion, Stratification, Bogs, Ponds, Carbon dioxide, Absorption, Oxygen sag, Anaerobic conditions, Organic matter, Photosynthesis, *Connecticut.
Identifiers: *Soft-water lake, *Benthic metabolism, Trophic dynamics, *Redox gradients, *Hypolimnetic oxygen deficit, Chemosynthesis, *Bacterial photosynthesis, Nutrient regulation, Alternate electron acceptors, *Dunham Pond(Conn).

A small, New England, soft-water lake accumulates more hypolimnetic CO2 during stratification than concomitant 02 uptake. Thus, benthic anaerobic metabolism is greater than benthic oxygen uptake estimates indicate, and energy-rich metabolic intermediates (alternate electron acceptors) are produced which may undergo deferred respiration (02 uptake) far from their origin (CO2 evolution). The energy released from these deferred transformations creates redox gradients, drives chemosynthesis and subsidizes bacterial photosynthesis in the water column. Because of the light limitation imposed by dissolved organic matter entering from the watershed, benthic respiration based largely upon terrestrial inputs, also, probably subsidizes the production of particulate organic carbon in the water column of Dunham Pond to a great extent. This pathway, which is important to the higher trophic levels of the lake, probably depends, in turn, upon a series of edaphic factors somewhat different than those thought to control algal production. (de Lara-Connecticut).
W76-11906

BENTHIC METABOLISM OF A SOFT-WATER LAKE,
Connecticut University, Storrs.
P. H. Rich.
Verh. Internat. Verin. Limnol., Vol. 19, p 1023-1028, October 1975. 3 fig, 2 tab, 7 ref. OWRT A-054-CONN (1) 14-31-0001-4007.

Descriptors: *Lakes, *Lake sediments, *Stratification, *Metabolism, *Chemical oxygen demand, *Carbon dioxide, *Dissolved oxygen, Ecosystems, *Connecticut.
Identifiers: *Soft-water lake, *Respiratory quotients, *Benthic metabolism, *Redox potential, *Alternate electron acceptors, *Dunham Pond(Conn).

Empirical respiratory quotients (RQ=C02/02) were obtained for Dunham Pond, a small, soft-water lake in the eastern crystalline highlands of Connecticut, by measuring the rates at which dissolved C02 (total) accumulated and dissolved 02 disappeared in the summer hypolimnion (below 2m) and beneath the ice in the winter. The data obtained from the hypolimnion during summer stratification indicate that more 02 than expected is taken up during the early part of stratification (negative C02 anomaly) and more C02 than expected is evolved during the latter part of stratification (positive C02 anomaly). Data obtained during winter (1973-74) stratification indicated some loss of identity of surface layers of water during a late January thaw, however, on a whole lake basis the same pattern of an early C02 anomaly and a later positive anomaly persisted. This cycle of unusual 02 uptake and C02 release suggests the uncoupling of oxidation from reduction in the sediments during most of the annual cycle and on a diurnal basis. Benthic respiratory quotients were found to increase with the duration of stratification, which suggests that RQ's are related to the redox potential and capacity of the sediments and not entirely to the composition of benthic organic matter. (de Lara-Connecticut)
W76-11907

PETROLEUM DEGRADATION IN LOW TEMPERATURE MARINE AND ESTUARINE ENVIRONMENTS,
Rhode Island Univ., Kingston. Dept. of Plant Pathology-Entomology.
For primary bibliographic entry see Field 5B.
W76-11924

THE BIOLOGICAL AND ECOLOGICAL EFFECTS OF OIL POLLUTION IN TROPICAL WATERS. AN ANNOTATED BIBLIOGRAPHY,
Smithsonian Institution, Washington, D. C. Office of International and Environmental Programs.
C. P. Onuf.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-248 899, $4.50 in paper copy, $3.00 in microfiche. Prepared for Agency for International Development, Dept of State, July 1973. 67 p, 112 ref. AID/csd 2608

Descriptors: *Continental Shelf, *Oil pollution, *Environmental effects, *Resources development, *Bibliographies, *Water pollution effects, *Water resources, *Pollution, Biological communities, Ecosystems, Tropical regions, California, Detergents, Fish, Shellfish, Industrial wastes, Littoral, Grasses, Mangrove swamps, Microbial degradation.
Identifiers: *Outer Continental Shelf, Biological effects, Petroleum, Hydrocarbons, Gulf of Mexico, Cuba, Panama, Puerto Rico.

The bibliography contains 112 references to biological and ecological effects of oil pollution in tropical waters with some involving effects in colder, high altitude waters. Formal annotations are supplemented by comments made by the compiler. (See also W76-11935) (Sinha - OEIS)
W76-11936

RESULTS OF OCEAN DIFFUSION AND BIOLOGICAL STUDIES OF THE HOLLYWOOD, FLORIDA, OCEAN OUTFALL,
Environmental Science and Engineering, Inc., Gainesville, Fla.
For primary bibliographic entry see Field 5B.
W76-11938

A STUDY OF THE EFFECTS OF DETERGENTS ON TYPICAL BILGE WATERS AND CORRELATION OF OIL PARTICLE SIZES,
General Electric Co., Philadelphia, Pa. Re-Entry and Environmental Systems Div
E. Batutis, H. Hogue, and J. McGinn
Available from the National Technical Information Service, Springfield, Va 22161, as AD A020 172, $7.75 in paper copy, $3.00 in microfiche. U. S. Coast Guard Final Report No. USCG-D-177-75, July 1975. 222 p, numerous fig and ref. append. DOT-CG-43287.

Descriptors: *Water pollution, *Detergents, *Waste water disposal, *Oil pollution, *Emulsifiers, *Oily water, Particle size, Oil wastes, Water resources.
Identifiers: *Bilge water.

Oil removal systems for treating bilge water are drastically affected by the condition, composition and character of the incoming bilge water-oil mixture. The presence of various detergents and cleansers causes emulsification of hydrocarbon products already present. The extent of emulsification caused by synthetic detergents on eight oil was studied at a fixed agitation rate and intensity as a function of detergent type (cationic, anionic or non-ionic) and concentration as well as temperature, pH, and salinity of the continuous (external) phase (distilled water). Laboratory test emulsions were generated using ultrasonic agitation, coupled with high speed non-aerating dispersion to simulate the type of emulsions produced by the action of a centrifugal pump. A HIAC Particle Counter was used to determine the amount of oil emulsified. The conclusions indicated that: (1) Detergents with cationic-active ingredients would promote a higher degree of emulsification than those with non-ionic or anionic type surfactants. (2) The amount of oil emulsified under fixed agitation rate and intensity and fixed oil concentration does not increase proportionally with increasing detergent concentrations. (3) The concentration of emulsified oil tends to approach a nearly constant value with increasing detergent concentration. (4) At low concentrations of detergent, 100 ppm, the effect of some detergents seems to be one of de-emulsification. An appendix is included in this report covering a correlation of particle size data generated by a number of investigators. (Sinha - OEIS)
W76-11939

RELEASE OF DISSOLVED ORGANIC MATTER BY AUTOLYSIS OF A SUBMERSED MACROPHYTE, SCIRPUS SUBTERMINALIS,
National Inst. for the Environment, Tsukuba (Japan).
A. Otsuki, and R. G. Wetzel.
Limnol Oceanogr. 19(5), p 842-845, 1974.

Descriptors: Dissolved solids, *Organic matter Production, Primary productivity, Lakes, Carbon
Identifiers: *Autolysis, *Macrophytes, *Scirpus Subterminalis, Total organic carbon, Angiosperms, Oxic conditions, Anoxic conditions.

Of the net production of the submersed freshwater angiosperm S. subterminalis, 30-40% was released as dissolved organic matter on autolysis. Most of the autolytic organic matter was released within days under both oxic and anoxic conditions and represents a major source of total dissolved organic C to a hard water lake in which the plant dominates primary productivity.--Copyright 1976, Biological Abstracts, Inc.
W76-11942

FOLLOW-UP FIELD SURVEY OF THE OIL POLLUTION FROM THE TANKER 'METUL'
Texas A and M Research Foundation, College Station.
R. W. Hann, Jr.
Available from the National Technical Information Service, Springfield, Va 22161 as AD-A

), $4.50 in paper copy, $3.00 in microfiche. U.S. ast Guard Final Report No. USCG-D-166075, ptember 1975. 56 p, 21 fig, 2 append. DOT-CG-44-A.

scriptors: *Oil spills, *Oil pollution, nvironmental effects, *Water fowl, *Mussels, ertidal areas, Benthos, Beaches, Coasts, Shellf- Resources, Fuels, Damages, Straits, Water lution, Water pollution sources.
ntifiers: Straits of Magellan, Tankers, Crude Mousse, Bunker C fuel oil, Environmental im-t.

August 9, 1974, the METULA, an oil tanker, aground on the Satellite Patch Shoal im-diately west of the First Narrows in the Straits Magellan. The initial spill of oil from the TULA was reported to be 6,000 tons. Sub-uent spills continued with the largest being 00 tons on August 19, until the total reported quantity of 51,5000 tons of crude oil and ap-ximately 2,000 tons of Bunker C fuel oil was hed. Over 128 kilometers or 80 miles of beach e evidence of oil impact. There appears to be tantial biological impact of the intertidal ne life, but the effect on other marine organ-is hard to determine. In the heavily oiled s, most adult mussels appear to be living, how-, an absence of very small or juvenile mussels noted. Changes in benthal worm populations algae were also noted. Further information on biological community will be available after atory studies of collected samples. The oil is still having a detrimental effect on marine rfowl and will continue to do so as long as un-lized oil or mousse is located at the top of the h zone and estuarine areas and as long as con-nated mussels are used as a food source. It evident from the study that there are other r sources of oil pollution in the Straits and the t of these chronic sources could ultimately e damaging to marine resources and most itely would make the proving of damages difficult in any future incident. (Sinha-OEIS) 11943

OIL AND GAS - AN ENVIRONMENTAL SSMENT. A REPORT TO THE PRE-NT BY THE COUNCIL ON ENVIRONMEN-QUALITY, VOLUME 1.
cil on Environmental Quality, Washington,

rimary bibliographic entry see Field 6G.
1947

OIL AND GAS - AN ENVIRONMENTAL SSMENT. A REPORT TO THE PRE-NT BY THE COUNCIL ON ENVIRONMEN-QUALITY, VOL 4, POTENTIAL ORE EFFECTS OF OIL AND GAS UCTION ON THE ATLANTIC AND GULF LASKA OUTER CONTINENTAL SHELF.
rce Planning Associates, Inc., Washington,

imary bibliographic entry see Field 6G.
1951

OIL AND GAS - AN ENVIRONMENTAL SSMENT. A REPORT TO THE PRE-T BY THE COUNCIL ON ENVIRONMEN-UALITY, VOL 5, POTENTIAL BIOLOGI-EFFECTS OF HYPOTHETICAL OIL ARGES IN THE ATLANTIC COAST AND OF ALASKA.
husetts Inst. of Tech., Cambridge, Mass.
mary bibliographic entry see Field 6G.
952

EFFECTS OF POLLUTANTS ON THE IOUR OF THE BIVALVE TELLINA S,
Lab., Aberdeen (Scotland).
irling.

Marine Pollution Bulletin, Vol. 6 (8), 1975, p 122-124, 3 tab.

Descriptors: *Copper, *Bioassay, *Laboratory methods, Physiology, *Toxicity, *Behavior, *Metabolism, *Mollusks, *Phenols, *Industrial wastes, Clams, Methodology, Chemical wastes, Water pollution effects, Testing.
Identifiers: *Tellina tenuis, Burrowing behavior, Continuous flow bioassay.

Predictions of safe levels of effluent discharge have in the past been largely based on the results of short term acute toxicity tests (LC50s). Such tests are usually carried out in unnatural experimental conditions, and in consequence the results are of only limited value. There is a need to enlarge the concept of the routine bioassay test to include quantitative measurement of the effects of pollutants on behavior, physiology and metabolism. A simple rapid bioassay test is described in which the effect of pollutants on the burrowing of the bivalve Tellina tenuis has been used as a quantitative measure of pollutant effect. (Katz)
W76-11960

ARSENIC IN MARINE ORGANISMS FROM WEST GREENLAND,
B. C. Research Ltd., Vancouver.
A. Bohn.
Marine Pollution Bulletin, Vol. 6(6), 1975, p. 87-89, 2 tab, 12 ref.

Descriptors: *Arsenic compounds, *Marine animals, Marine fish, *Invertebrates, *Mussels, *Molluscs, Marine algae, *Crustaceans, *Zooplankton, *Marine plants, *Path of pollutants, Atlantic Ocean, Physiology, Trace elements, Metals, Water pollution effects.
Identifiers: *Trace metals, Background levels, *Greenland, Tissue metal content.

Natural background levels of trace metals in marine organisms from a West Greenland inlet were studied during the summer of 1972 and 1973. Dry weight arsenic levels ranged from 11.1 to 307 ppm in fish fillets and from 7.6 to 512 ppm in fish livers. Prawns had arsenic levels ranging up to 80.2 ppm, contrasting with 6.0 ppm in planktonic copepods. The results suggest that in certain marine organisms organo-arsenics predominate and are less toxic than inorganic arsenic compounds. (Katz)
W76-11962

CADMIUM LEVELS AND CARBOHYDRATE METABOLISM IN LIMPETS,
Bristol Polytechnic (England). Dept. of Science.
R. Shore, G. Carney, and T. Stygall.
Marine Pollution Bulletin, Vol. 6(12), 1975, p. 187-189, 1 tab, 3 fig, 12 ref.

Descriptors: *Cadmium, *Metals, *Pathology, *Metabolism, Biochemistry, *Mollusks, Physiology, Diets, Digestion, Benthos, Marine animals, Water pollution effects.
Identifiers: *Carbohydrate metabolism, *Limpets, Bristol channel, Glucose levels, Glucose metabolism, Cadmium levels, Glycolytic rate, Tissue cadmium concentration.

Limpets from several sites in the Bristol Channel exhibiting varying degrees of cadmium contamination have been studied. Investigations involved glucose levels and certain aspects of glucose metabolism. The results tentatively suggest that there may be a correlation between cadmium levels and reduced ability to utilize glucose. (Katz)
W76-11963

TRACE METAL CONTENT IN THE AMERICAN OYSTER,
National Marine Fisheries Service, Milford, Conn. Milford Lab.
R. A. Grieg, B. A. Nelson, and D. A. Nelson.
Marine Pollution Bulletin, Vol. 6(5), 1975, p. 72-73, 1 tab, 6 ref.

Descriptors: *Oysters, *Path of pollutants, Transfer, *Reproduction, Biology, *Gonads, Mollusks, *Cadmium, *Copper, Lead, Zinc, Fertility, Chemical analysis, *Connecticut, Marine animals, Water pollution effects, Path of pollutants, Estuarine environment.
Identifiers: *American oyster, *Oyster eggs, *Housatonic River(Conn), Silver.

Information about the transfer of pollutants from adult aquatic animals to their progeny is relatively scarce. This study was designed to measure the transfer of metals from adults to eggs of the American oyster. Two groups of oysters containing significantly different levels of copper and cadmium were induced to spawn, the eggs were collected and trace metal contents measured. The eggs from both groups of oysters contained the same amount of copper, while cadmium levels were below detectable limits in both groups of eggs. Silver, lead and zinc concentrations also were determined. The concentrations of these metals were similar for both groups of adults and eggs; thus, no conclusion could be made about the transfer of these three metals from adults to eggs of oysters. (Katz)
W76-11964

DISTRIBUTION OF SOME TRACE METALS IN POOLE HARBOUR, DORSET,
Imperial Coll. of Science and Technology, London (England). Applied Geochemistry Research Group.
For primary bibliographic entry see Field 5B.
W76-11965

TRACE METALS IN OYSTERS FROM KNYSNA ESTUARY,
National Physical Research Lab., Pretoria (South Africa).
For primary bibliographic entry see Field 2L.
W76-11966

TOXICITY OF THREE OILS TO BIVALVE GAMETES AND LARVAE,
Siena Univ. (Italy). Inst. of Comparative Anatomy.
A. Renzoni.
Marine Pollution Bulletin, Vol. 6(8), 1975, p. 126-128, 3 tab, 1 fig, 13 ref.

Descriptors: Oil, *Oil pollution, *Toxicity, *Bioassay, *Mortality, *Mollusks, *Oysters, Laboratory animals, *Growth rates, *Immature growth stage, *Larval growth stage, Life cycle, Environmental effects, Larvae, Fertilization.
Identifiers: *Crude oil, Kuwait crude, Nigerian crude, Prudhoe Bay crude, Developmental abnormalities, Larval survival, Clam spermatozoa.

Water soluble extracts of three crude oils, Kuwait, Nigerian and Prudhoe Bay have been tested using the sperm and eggs of two marine bivalves. Fertilization is depressed and developmental abnormalities sometimes appear after exposure to these toxins. The spermatozoa, in particular, are very sensitive to the water-soluble fractions of these oils. Nigerian crude is particularly toxic. (Katz)
W76-11967

REDUCED GROWTH AND SURVIVAL OF CLAMS TRANSPLANTED TO AN OIL SPILL SITE,
Maine State Dept. of Marine Resources, Augusta.
R. L. Dow.
Marine Pollution Bulletin, Vol. 6(8): 1975, p. 124-125, 1 tab., 3 ref.

Descriptors: *Oil pollution, Environmental effects, Animal physiology, *Mortality, *Growth rates, *Animal growth, *Productivity, *Mudflats, Mollusks, Clams, Estuaries, Oil spills, Intertidal areas, Estuarine environment.

Identifiers: Soft shell clams, Polluted mud, Transplantation, Mya arenaria, Oil spill site.

Production of soft clams fell by 20% in two years following oil pollution although in adjacent mudflats production of them increased by 250%. Transplanting uncontaminated clams into this area confirmed poorer survival and slower growth in polluted mud. (Katz)
W76-11968

HINDGUT MICROFLORA FROM OIL-POLLUTED SOFT-SHELL CLAMS,
Rhode Island Univ., Kingston. Dept. of Plant Pathology-Entomology.
A. M. Cundell, and R. R. Young.
Marine Pollution Bulletin, Vol. 6(9), 1975, p. 134-135. 2 tab.

Descriptors: *Mollusks, Oil, *Oil pollution, Microbiology, *Clams, *Digestion, Metabolism, *Biodegradation, *Aquatic microorganisms, Sediments, Physiology, Animal physiology, Water pollution effects, Estuarine environment, Bays, Rhode Island.
Identifiers: Soft-Shell Clams, Mya Arenaria, Hindgut microflora, Narragansett Bay(RI).

The natural microflora resident in the hindgut of the soft-shell clam Mya arenaria appear to have no role in the biodegradation of petroleum hydrocarbons in oil-polluted estuarine sediments. (Katz)
W76-11969

DISTRIBUTION AND ABUNDANCE OF THE POLYCHAETOUS ANNELIDS IN A SOUTH FLORIDA ESTUARY,
University of South Florida, Tampa. Dept. of Biology.
S. L. Santos, and J. L. Simon.
Bull Mar Sci. 24(3), p 669-689, 1974.

Descriptors: *Florida, Estuaries, *Annelids, Distribution, Vegetation, Estuarine environment.
Identifiers: Diplanthera-Wrightii, Onuphis-Eremita-Oculata, Polychaetous annelids, Thalassia-Testudinum, *Polychaetes.

This distribution and abundance of polychaetous annelids in a subtropical estuarine environment were investigated. The area contained zones of Thalassia testudinum, Diplanthera wrightii, and sand. Quarterly samples were taken from stations established within all zones. No seasonal differences in particle size distribution of sediment were found. The Thalassia zone supports the largest number of organisms. Onuphis eremita oculata was the dominant polychaete. Czekanowski's coefficient and group average sorting were used to determine relationships among the fauna from each zone. Information statistic tests were utilized to delineate classes. Different assemblages of polychaetes were not associated with different vegetative zones. The densities of the individual species from the one assemblage present in Lassing Park, St. Petersburg, Florida, varied by season and by zone.--Copyright 1975, Biological Abstracts, Inc.
W76-11987

HOW MODERN TECHNOLOGY IS ENDANGERING OUR LIVES: OCEAN POLLUTION,
For primary bibliographic entry see Field 5G.
W76-12018

STRUCTURE AND FUNCTION OF STREAM ECOSYSTEMS,
Michigan State Univ., Hickory Corners. W. K. Kellogg Biological Station.
For primary bibliographic entry see Field 2I.
W76-12137

CARBON-13 ENRICHED CARBONATE IN INTERSTITIAL WATERS OF LAKE KINNERET SEDIMENTS,
Weizmann Inst. of Science, Rehovoth (Israel). Dept. of Isotope Research.
M. Stiller, and M. Magaritz.
Limnol Oceanogr. 19(5), p 849-852, 1974.

Descriptors: *Lake sediments, *Carbonates, Connate water, *Dissolved solids, Lakes, Asia, Alkalinity, *Calcite, Decomposing organic matter, Anaerobic conditions, Calcium carbonate.
Identifiers: Carbon-13, *Lake Kinneret(Israel).

Dissolved carbonates in interstitial waters of Lake Kinneret sediments (Galilee, Israel) are enriched in 13C by 10-20% over the dissolved carbonate in the lake water. The increase of alkalinity which accompanies this enrichment indicates in situ formation of dissolved carbonate. The interstitial waters are slightly undersaturated in respect to calcite, but dissolution of CaCO3 cannot explain the enriched 13C values. The enrichment of 13C in the pore water carbonate is probably related to the anaerobic decomposition of organic matter in the sediments.--Copyright 1975, Biological Abstracts, Inc.
W76-12140

TRANSFORMATIONS OF METHYLAMINES AND FORMATION OF A HAZARDOUS PRODUCT: DIMETHYLNITROSAMINE, IN SAMPLES OF TREATED SEWAGE AND LAKE WATER,
International Inst. of Tropical Agriculture, Ibadan (Nigeria).
For primary bibliographic entry see Field 5B.
W76-12141

CHLORAMINE-T FOR THE CONTROL OF ICHTHYOPHTHIRIUS MULTIFILIIS (FOUQUET),
Ministry of Agriculture, Fisheries and Food, London (England). Salmon and Freshwater Fisheries Lab.
D. G. Cross, and P. A. Hursey.
J Fish Biol. 5(6), p 789-798, 1973.

Descriptors: *Toxicity, Testing, Organic compounds, Protozoa, Parasites, *Fish diseases, Hydrogen ion concentration.
Identifiers: *Ichthyophthiriasis, *Ichthyophthirius-Multifiliis, Parasit-Drug, Rasbora-Heteromorpha, Rutilus-Rutilus, *Chloramine-T, *Amines.

Tests were conducted to determine the toxicity of chloramine-T to the free-living stages of the protozoan parasite I. multifiliis and the fish Rasbora heteromorpha and Rutilus rutilus with the view to using the reagent to control ichthyophthiriasis. The toxicity was dependent on the pH value of the water and, to a lesser extent, its hardness. A method of treating the disease is proposed and discussed.--Copyright 1974, Biological Abstracts, Inc.
W76-12143

5D. Waste Treatment Processes

WATER POLLUTION CONTROL: CROSSROADS OF A MUNICIPAL FINANCIAL DILEMMA,
North Texas State Univ., Denton. Dept. of Administrative Sciences and Marketing.
F. P. Williams, and A. C. Rucks.
Public Works, Vol. 107, No. 6, p 86-88, June, 1976. 1 fig, 1 tab, 21 ref.

Descriptors: *Waste water treatment, *Treatment facilities, *Analytical techniques, *Water pollution control, *Financing, Local governments, Economics, Decision making.

Financial and economic considerations are needed in environmental decision making. The discussion includes the amount of financing required by municipalities, the goals of the Water Pollution Control Act Amendments of 1972, some alternative financial resources available to municipalities, and the need for careful evaluation of these alternatives. The Environmental Protection Agency (EPA) estimated, via the 1974 'Needs Survey,' that municipalities will require an investment of $114.6 billion in waste treatment facilities to accommodate urban populations in 1990. The per capita costs were estimated at $549 in 1972 and $464 in 1990. Adjusted estimates are $1,500 per capita in 1972 and $1,265 per capita in 1990. The traditional methods of financing municipal projects such as waste water treatment include property taxes, user charges, special assessments and bond issues. The EPA also provides waste treatment construction grants. Cities have encountered difficulties, however, in obtaining these funds. It has also been reported that some states are penalized with respect to funds because their cities have been more effective than others in applying advanced waste treatment technology. The effects on individual cities of alternative forms of financing should be analyzed. The analysis should include cost estimates for achieving national water quality goals, an appraisal of the ability of internal sources of funds to meet these costs and the extent to which external sources will be needed, and an appraisal of the per capita impact of using alternative sources of funds. (Snyder-FIRL)
W76-11626

ODOUR CONTROL AT TORONTO'S ASH BRIDGES BAY TREATMENT PLANT.
Water and Pollution Control, Vol. 114, No. 6, p 40-41, June, 1976. 1 fig.

Descriptors: *Waste water treatment, *Sewage treatment, *Treatment facilities, Odor, Control, Incineration, Screens, Ozone, Oxidation lagoons, *Canada.
Identifiers: Aeration tanks, Aerated grit tanks, Primary tanks, Scrubbers, *Odor control.

Odor control facilities are being installed in three municipal sewage treatment plants in Toronto. Major sources of the odors at the Main Treatment Plant, Ashbridge Bay, were found to be the aeration tanks, multi-hearth incinerators, aerated grit tanks and screens, and primary tanks. The aeration tank odors, consisting of normal spent diffused air plus ventilated air from the covered primary tanks, will be eliminated by ozonation, followed by wet scrubbing. With this system, any odors not oxidized by ozonation will be oxidized in the cross flow scrubbers. The level of ozone in the discharged air, after scrubbing, will be below the 0.08 ppm limits required by law. A detailed description of the system is provided, including the axial fans to discharge emission air, measurement instrumentation for ozone pressure and concentration, and process automation facilities. (Kramer-FIRL)
W76-11627

ALTERATION OF MICROBIAL POPULATIO IN THERMAL STRESS,
Texas Univ. Health Science Center, Houst School of Public Health.
R. K. Guthrie, D. S. Cherry, and F. L. Singleton
Journal Water Pollution Control Federation, V 48, No. 5, p 962-965, May, 1976. 3 fig, 7 ref.

Descriptors: *Waste water treatment, *Biologi treatment, *Thermal stress, *Bacteria, *E c Municipal wastes, Pathogenic bacteria, Ent bacteria, Coliforms, Streptococcus, Salmone Evaluation.

The hypothesis that thermal loading to 31 C waste water effluent to which Flavo-bacterium tescens is added increases the die-off rates Escherichia coli, Streptococcus faecalis, and

eric pathogen Salmonella typhimurium was ted. In laboratory tests using municipal waste ter containing Flavobacterium lutescens and ted to 31 C, Streptococcus faecalis counts ained stable for 2 weeks and then dropped to by day 20. Escherichia coli counts remained stant for 1 week and then declined gradually to on day 14. Salmonella typhimurium counts ained stable for 2 weeks at 31 C before a rapid line began, and no colonies were detected by 30. The results indicate that the use of a natu- occurring aquatic bacterial species in com- tion with thermal stress offers a potential con- of undesirable or pathogenic bacterial con- nants in aquatic systems. (Kreager-FIRL)
-11629

IOTE CONTROL OF COMBINED SEWER ERFLOWS,
ermantion, Inc., Saint Paul, Minn.
Anderson, and R. L. Callery.
ater Pollut Contr Fed. 46(11), p 2555-2564,

riptors: *Combined sewers, *Remote control, rflow, Instrumentation, Costs, Distribution, matic control, Minnesota, Cities.
ifiers: Minneapolis-St. Paul(Minn).

flows from combined sewers may be con- d by the use of simple regulator modifica- and readily available computer and teleme- technology, as was demonstrated in Min- olis-St. Paul, Minnesota. This method of con- oduced a 52% decrease in overflow in- ce and an 84% reduction in overflow quantity 70. Combined snow-melt runoff and waste- overflow were nearly eliminated. Total pro- osts were estimated. The system yielded data mporal and spatial distribution of precipita- n the area.--Copyright 1975, Biological Ab- s, Inc.
1630

CIENCY OF A SEPTIC TILE SYSTEM,
td., Fredericton (New Brunswick).
araghavan, and R. G. Warnock.
l Water Pollution Control Federation, Vol. . 5, p 934-944, May, 1976. 8 fig, 3 tab, 11 ref.

ptors: *Tiles, *Tile drainage, *Septic tanks, e water treatment, On-site tests, Efficien- Biochemical oxygen demand, Chemical ox- emand, Suspended solids, Phosphates, Am- Nitrification, Carbon, Organic com- s, Performance.

investigation to determine the efficiency of c tile system was conducted near Ottawa, . The test tile was at an average depth of 26 the soil in the area was a mixture of Pied- sandy loam texture) and Pontiac (silt loam clay loam texture). The results indicated e surrounding soil reduced total suspended biochemical oxygen demand, chemical ox- emand, and soluble organic carbon by 75- their levels in the septic tank. Reductions sphates were usually in the 25-50% range, wer than those reported in the literature. ia reductions ranged between 80 and 90%, creases in ammonia reduction were y accompanied by corresponding in- in nitrification. The efficiency of the septic em was influenced by seasonal variations, ater efficiencies (80-90%) being observed mmer and early fall. (Kreager-FIRL)
31

HORUS TRANSPORT IN A PACKED ACTOR,
Univ., Gainesville. Dept. of Agricultural ring.
erman, R-L. Chu, and W. G. Leseman.
Water Pollution Control Federation, Vol. , p 880-888, May, 1976. 11 fig, 11 ref.

Descriptors: *Packed beds, *Model studies, *Tertiary treatment, *Waste water treatment, *Phosphorus, Chemical reactions, Dispersion, Adsorption, Convection, Flow rates, Municipal wastes, Irrigation, Mathematical models.
Identifiers: Fixed bed reactors.

A dispersed flow model of phosphorus transport in a packed bed reactor (soil) was developed to gain information on the fate of this nutrient in advanced waste treatment processes handling municipal waste water. The model adequately described both transient response and steady-state distributions and showed that the processes of dispersion, convection, chemical reaction, and adsorption are relevant to transport. Transport coefficients of dispersion, reaction, and adsorption were found sensitive to pore velocity (flow rate); this apparently was due to the treatment of a heterogeneous reactor as an equivalent homogeneous reactor for the purpose of providing a transport equation amenable to mathematical solution. The usefulness of the model is not particularly limited by this approximation. Phosphorus measurements from a field under irrigation with municipal waste water (fixed bed reactor) exhibited a steady-state distribution which closely agreed with that of the laboratory model (packed bed reactor). (Kreager-FIRL)
W76-11632

MOST PROBABLE NUMBER VERSUS MEMBRANE FILTER ON CHLORINATED EFFLUENTS,
Rockland County Sewage Treatment Plant, Orangeburg, N. Y.
A. Mowat.
Journal Water Pollution Control Federation, Vol. 48, No. 4, p 724-728, April, 1976. 3 tab, 4 ref.

Descriptors: *Coliforms, *Analytical techniques, *Sewage treatment, *Treatment facilities, *Chlorination, *Quality control, Statistics, Evaluation, Microorganisms, Bacteria, Waste treatment, Effluents, Measurement, Membrane processes, *Pollutant identification.
Identifiers: Most probable number technique.

A total of 25 experiments were conducted at a sewage treatment plant using the activated sludge process to compare the results obtained by the most probable number and membrane filter techniques for total coliform determination on chlorinated and unchlorinated secondary effluent. Great discrepancies between the two methods were observed for unchlorinated effluent, whereas good correspondence between the two techniques was obtained for chlorinated secondary effluent, especially at bacterial densities below 1000. Samples with 30-minute chlorination times yielded better agreement between the two techniques than did samples with only 15-minue chlorination times. This may indicate that the longer chlorination time effected a good kill of the bacteria, while the shorter chlorination time was only partially effective, allowing recovery of the bacteria under favorable conditions. The discrepancy between the two methods for unchlorinated samples remains unexplained. (Kreager-FIRL)
W76-11635

EPA GUIDANCE AND POLICY ON LAND TREATMENT,
Environmental Protection Agency, Washington, D. C. Office of Water Programs.
J. T. Rhett.
In: Land Application of Wastewater, November 20-21, 1974, Newark, Delaware, p 1-2.

Descriptors: *Waste water treatment, *Waste water disposal, *Federal jurisdiction, *Land use, Legislation, Financing, Economics, Groundwater.
Identifiers: *Land application.

Environmental Protection Agency policies on waste water treatment and disposal are reviewed, with particular emphasis on land treatment. An agency document entitled 'Alternative Waste Management Techniques for Best Practicable Waste Treatment' identifies currently known techniques for meeting the requirements of the Water Pollution Control Act Amendments. The choice of which alternative to adopt is left to each municipality or regional sanitary district; however, if an area receives federal funds, it must be guided by the Agency's cost effectiveness regulations. Any land application or land utilization techniques considered must comply with criteria designed to protect groundwaters in order to qualify for federal funding. The deputy administrator of the Environmental Protection Agency has indicated that land treatment may be used in lieu of other systems of waste management if it can be demonstrated land treatment is the most cost effective alternative, is consistent with the environmental assessment, and satisfies applicable tests. (See also W76-11231) (Kreager-FIRL)
W76-11638

PUBLIC HEALTH ASPECTS OF LAND APPLICATION OF WASTEWATER EFFLUENTS,
Army Medical Bioengineering Research and Development Lab., Fort Detrick, Md.
C. A. Sorber.
In: Land Application of Wastewater, November 20-21, 1974, Newark, Delaware, p 27-33. 7 tab, 18 ref.

Descriptors: *Overland flow, *Infiltration, *Irrigation, *Public health, *Waste water treatment, Pathogenic bacteria, Sodium, Ions, Nitrates, Ponding, Mosquitoes, Diseases, Dissolved solids, Potable water, Municipal wastes, Aerosols.
Identifiers: *Land application.

Waste water treatment involving such land application methods as overland flow, rapid infiltration, and spray irrigation is discussed in terms of its public health impacts. In general, potential health and environmental problems can be minimized by proper waste water treatment and proper site selection. Problems that may be encountered include pathogenic aerosols near spray sites, the enhancement of mosquito breeding at ponding sites, and the presence of sodium and nitrate ions as well as total dissolved solids where waste water recycle is practiced. High sodium contents may be harmful to individuals suffering from cardiac, renal, and circulatory diseases. The nitrate ion is the causative agent of methemoglobinemia in children, and a concentration of no more than 10 mg/liter for nitrate-nitrogen is recommended for drinking water supplies. Pathogens in waste water represent one of the major potential health problems associated with recycling municipal waste water on the land. (See also W76-11231) (Kreager-FIRL)
W76-11639

EDUCATIONAL AND INFORMATIONAL NEEDS FOR ACHIEVING PUBLIC ACCEPTANCE,
Purdue Univ., Lafayette, Ind. Cooperation Extension Service.
For primary bibliographic entry see Field 5G.
W76-11640

THE ENVIRONMENTAL AND SOCIOLOGICAL IMPACT OF RECYCLING OF AGRICULTURAL WASTE BY LAND USE,
Green Valley Farms, Avondale, Pa.
B. J. Reynolds.
In: Land Application of Wastewater, November 20-21, 1974, Newark, Delaware, p 53-57. 2 ref.

Descriptors: *Irrigation, *Waste treatment, *Recycling, *Waste disposal, *Farm wastes, Stabilization, Ponding, Effluents, Ammonia, Coliforms, Phosphates, Bacteria, Biochemical oxygen demand, Crop production, Social aspects, On-site investigations.

The results of an experimental agricultural waste recycling program being conducted at the Green Valley Farms in New Garden Township, Pennsylvania are presented. The basic raw material being recycled is manure effluent discharged by 200 head of milking cows into two stabilization ponds. The effluent is composed of the manure and urine excreted by the animals, wash water for cleaning the concrete pads, and milkhouse and milking parlor wastes. The biologically treated effluent is applied to crops and woodlands by a spray irrigation system. As a result of the growth of the crops and woodlands, the following waste removals are observed: 99.6% of the ammonia in the treated effluent (there is no nitrate in the stabilization ponds), 99.6% of the phosphates, 5-day biochemical oxygen demand, and total as well as fecal coliform. Waste recycling on the farm has resulted in a doubling of corn production, a tripling of soybean production, and large increases in both the tonnage and protein content of grasses. The community response to the land treatment program has been very favorable. (See also W76-11231) (Kreager-FIRL)
W76-11641

EXPERIENCE WITH LAND APPLICATION OF WASTEWATER AND STATE REGULATIONS - THE PENNYPACK WATERSHED,
Martin (A. W.) Associates, Inc., King of Prussia, Pa.
G. H. Emrich.
In: Land Application of Wastewater, November 20-21, 1974, Newark, Delaware, p 69-63. 6 fig.

Descriptors: *Irrigation, *Waste water disposal, *Recycling, *Water management(Applied), *Water supply, Groundwater, Surface waters, Watersheds(Basins), Wells, Waste treatment, Regulation, *Pennsylvania.
Identifiers: *Land application, Pennyback watershed(Penn).

The water balance for the Pennypack Watershed is analyzed, and spray irrigation of waste water is concluded to be the most cost-effective waste treatment option for the area. The watershed is capable of accepting up to 4.5 million gallons/day or 1.5 billion gallons/year of treated waste water. This could create a significantly desirable effect on the base flow in the streams and tributaries near the spray areas or could be developed as a groundwater supply. Assuming that 2 in/week of treated waste water (the maximum permitted in Pennsylvania) is spray irrigated onto a site and assuming 80% infiltration, 83 in. of additional water is added to the groundwater reservoir each year. It also is possible to selectively develop water well fields which are contiguous with the spray irrigation fields, thus enabling the recapture of an estimated 50% of the spray irrigated water for public water supply use. The remaining 50% would supplement the base flow in nearby streams. (See also W76-11231) (Kreager-FIRL)
W76-11642

EXPERIENCE WITH LAND APPLICATION OF WASTEWATER AND STATE REGULATIONS - PENNYPACK WATERSHED-PENNSYLVANIA,
Pennypack Watershed Association, Bryn Athyn, Pa.
F. U. Pitcairn.
In: Land Application of Wastewater, November 20-21, 1974, Newark, Delaware, p 65-67. 3 ref.

Descriptors: *Irrigation, *Water management(Applied), *Waste water disposal, *Sewage treatment, *Recycling, *Water supply, Groundwater, Surface waters, Watersheds(Basins), Waste water treatment, Costs, Regulation, Legislation, Land use, Regional development, *Pennsylvania.
Identifiers: *Land application, Pennyback watershed(Penn).

Water quantity management for the Pennypack Watershed in Pennsylvania is discussed in terms of existing state legislation and the desirability of applying secondarily treated sewage to the land via spray irrigation. The only plan now in existence for the watershed are 10-year plans for sewage facilities in accord with the provisions of the Pennsylvania Sewage Facilities Act. These plans are piecemeal, fragmented attempts to solve short-term problems, with little attention devoted to long-term, regional water management. The Pennypack Watershed Association has identified more than 600 acres of land eminently suited for spray irrigation; these lands could handle up to 4 million gallons/day of secondarily treated sewage. Spray irrigation is capable of recharging the groundwater supply, maintaining the watershed's water balance, augmenting stream flows, minimizing water pollution, and reducing water treatment costs by obviating the necessity for tertiary treatment. (See also W76-11231) (Kreager-FIRL)
W76-11643

LAND DISPOSAL OF WASTEWATER IN THE COMMONWEALTH OF PENNSYLVANIA - A REGULATORY VIEW,
Pennsylvania Department of Environmental Resources, Harrisburg. Burea of Water Quality Management.
S. F. Curran, Jr.
In: Land Application of Wastewater, November 20-21, 1974, Newark, Delaware, p 69-70. 3 ref.

Descriptors: *Irrigation, *Waste water disposal, *Waste water treatment, *Recycling, *Regulation, *State jurisdiction, *Pennsylvania, Water management(Applied), Sites, Groundwater, Treatment.
Identifiers: *Land application.

Waste water disposal via spray irrigation in the Commonwealth of Pennsylvania is discussed from a regulatory point of view. Since large amounts of waste water discharged to the land surface infiltrate and recharge groundwater, all spray irrigation installations in Pennsylvania are considered as discharges to the waters. Spray irrigation should be used only in situations where the waste water contains materials that can be renovated in the soil mantle and do not pollute groundwater. Generally, the equivalent of secondary treatment must precede the irrigation. The Pennsylvania Department of Environmental Resources makes allowances for variability of earth materials, spray field use, and effluent constituents in reviewing installation proposals on a site by site basis. The prime consideration for site selection is the ability of the organic and earth materials to properly treat the waste water. (See also W76-11231) (Kreager-FIRL)
W76-11644

DISINFECTION, DECHLORINATION AND TOXICITY TO FISH,
International Pacific Salmon Fisheries Commission, Cultus Lake (British Columbia). Sweltzer Creek Salmon Research Lab.
For primary bibliographic entry see Field 5C.
W76-11645

VIRAL CONTAMINATION OF THE WATER ENVIRONMENT, AN UNDERESTIMATED PROBLEM,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5C.
W76-11646

COMPUTER AIDED PLANNING OF A REGIONAL DISPOSAL SYSTEM FOR MUNICIPAL SLUDGE,
B and P Engineers, Kitchener (Ontario).
F. J. Allan, P. L. Silveston, W. L. Keay, and E. R. Simonen.
In: Annual Conference Proceedings of the Ontari Section of the American Water Works Associa tion, Pollution Control Association of Ontario, an Ontario Municipal Water Association. April 20-2 1975, Toronto, Ontario, p 115-135. 10 fig, 4 tab

Descriptors: *Sludge disposal, *Computer pro grams, *Cost analysis, *Regional analysis, M nicipal wastes, Waste disposal, Treatment faci ties, Planning, Economics, Regional developmen

A computer program for planning the region disposal of municipal sludge is described. The pr gram is capable of searching numerous altern tives which exist between the two extremes of centralized facility serving all sludge sources and decentralized disposal system with a dispos system for each sludge source. The computer pr gram divides sludge disposal planning into thr interacting sub-problems: facility planning, alloc tion of sludge to the facilities, and sludge transpo planning. The planner submits several locatio and types of facilities to the computer whi searches for the most economic system. A u training manual which provides information data sources and set-up procedures is also avai ble. (See also W76-11249) (Kreager-FIRL)
W76-11647

URBAN DRAINAGE - PROBLEMS AND POS BILITIES,
Nova Scotia Technical Coll., Halifax. Dept. Civil Engineering.
D. H. Waller.
In: Annual Conference Proceedings of the Onta Section of the American Water Works Asso tion, Pollution Control Association of Ontario, Ontario Municipal Water Association, April 20- 1975, Toronto, Ontario, p 136-153. 3 tab, 17 ref.

Descriptors: *Drainage water, *Drainage syste *Urban drainage, *Urban runoff, *Soil erosi Sewers, Surface waters, Groundwater, Turbid Water pollution effects, Land use, Land devel ment, Sediment load, Effluents, Industrial was Municipal wastes.

Problems associated with urban drainage reviewed along with some proposed soluti Changes in ground cover and surface topogra that occur as a result of urban development are sociated with a drop in groundwater le decreased stream flows during dry weather, increased soil erosion which results in sur water turbidity and sediment accumulation lakes, storage basins, and sewage plants. Drai problems associated with already developed u areas include those associated with overlo drainage systems and pollution problems du combined sewer overflows, urban surface ru and municipal and industrial effluents. Solut proposed for such problems include: careful development which takes advantage of na storage, combined sewer separation, source collection system controls, storage systems w are capable of holding wet flow for treatment lowing storm periods, and treatment systems are designed to handle wet weather flows. value of using urban drainage system model solving the above problems is also discussed. also W76-11249) (Kreager-FIRL)
W76-11648

SAFETY IN WATER AND WASTEWA PLANTS,
Ontario Ministry of the Environment (Toronto
For primary bibliographic entry see Field 5G.
W76-11652

OPERATOR TRAINING AND CERTIFICA IN CANADA,
Environmental Protection Service, O (Ontario).
For primary bibliographic entry see Field 5G.
W76-11653

AINING AND CERTIFICATION,
tario Ministry of the Environment, Toronto.
aining, Certification and Safety Section.
r primary bibliographic entry see Field 5G.
6-11654

RTHERN ENVIRONMENTAL ENGINEER-
- A CANADIAN CHALLENGE,
nley Associates Engineering Ltd., Edmonton
berta).
N. Dawson, and J. W. Slupsky.
Annual Conference Proceedings of the Ontario
tion of the American Water Works Associa-
, Pollution Control Association of Ontario and
ario Municipal Water Association, April 20-23,
5, Toronto, Ontario, p 376-402. 7 tab, 13 ref.

criptors: *Waste treatment, *Water supply,
mates, *Topography, *Canada, *Water pollu-
effects, Sewage treatment, Waste water treat-
t, Viruses, Model studies, Computer pro-
ns, Temperature, Permafrost, Incineration,
ogical treatment, Pipelines, Oxidation
ons, Research and development, Programs.
tifiers: Northwest Territories.

earch programs dealing with water supply and
e disposal in the Northwest Territories of
ada are reviewed. Studies currently being con-
ed include: the feasibility of using vacuum
ts and incineration for the disposal of human
es at construction campsites; the economics
operating problems associated with trailer-
nted physical-chemical sewage treatment
ms; the suitability of rotating biological con-
rs for treating workcamp waste water; the
mination of virus removal rates from waste
rs generated by current treatment methods;
se of steady state computer models for pre-
g subsidence and temperature profiles in ox-
n lagoon berms located in permafrost soils;
ate of human wastes which are dumped into
n arctic areas; the effect of buried pipelines
rmafrost thawing; and, the practicability and
ency of long retention lagoons used for waste
treatment at high latitudes. Special attention
ng devoted to the adverse weather and terrain
tions of the Northwest Territories which
in a more fragile ecology and the need for a
understanding of the impact of waste
sal practices. (See also W76-11249) (Kreager-
)
11655

SYMBIOTIC APPROACH TO WATER
E IN ST. PETERSBURG, FLORIDA,
, Crow and Eidsness, Inc., Clearwater, Fla.
Dove.
3rd National Conference on Complete
Reuse, June 27-30, 1976, Cincinnati, Ohio, p
3 fig, 3 tab, 16 ref.

iptors: *Water reuse, *Recycling,
oducts, Waste water treatment, Sludge, Fer-
s, Dewatering, Drying, Irrigation, Injection
Groundwater, Florida, Cities, Research and
opment, Potable water, Water utilization,
nent facilities, Waste treatment.

rch and development programs employing
mbiotic approach for water reuse in St.
burg, Florida are outlined. The programs in-
Deep well injection and possible recovery
rm water and treated waste water as a
ement for imported groundwater; zero
rge and total recycling of treated waste
for irrigation, air conditioning, power plant
and other applications; the installation of
water-saving devices in private toilets to
potable water usage; the production of
waste water sludge for sale to commercial
er compounders; and the application of
d sludge as a soil conditioner. A tentative
for a centralized sludge dewatering and dry-
ility for the city is also presented. (See also
257) (Kreager-FIRL)
656

SOLID WASTE, SEWAGE, AND ENERGY - A SYMBIOTIC APPROACH,
Energy Management Group, New York.
J. C. Dale.
In: 3rd National Conference on Complete WateReuse, June 27-30, 1976, Cincinnati, Ohio, p 35-36.

Descriptors: *Water reuse, *Recycling, *Waste water treatment, *Cities, Water supply, Industrial wastes, Municipal wastes, Sewage, Water utilization, Fuels.

The potential benefits of using a symbiotic approach to solve problems associated with the generation of municipal and industrial solid wastes and sewage, industrial water supply needs, and fuel shortages are discussed. A hypothetical example involving a city with a population of 100,000 is used to show that waste garbage, sewage, and animal wastes can be used for producing gas fuel for industrial needs and char which can be used as filter media for tertiary treatment at a sewage treatment plant. The treated sewage effluent can then be reused for industrial purposes not requiring potable water. (See also W76-11257) (Kreager-FIRL)
W76-11657

THE U. S. ENVIRONMENTAL PROTECTION AGENCY: PAST AND FUTURE CHALLENGES,
Environmental Protection Agency, Washington, D. C.
R. E. Train.
In: 3rd National Conference on Complete WateReuse, June 27-30, 1976, Cincinnati, Ohio, p 43-45.

Descriptors: *Water reuse, *Recycling, *Symbiosis, *Municipal wastes, *Waste water, Irrigation, Reclamation, Reclaimed water, Recreation facilities, Lakes, Industrial water, Research and development, Government supports, Government finance, Organizations, Treatment facilities.
Identifiers: *Environmental Protection Agency.

Environmental Protection Agency activities in the areas of waste water treatment and water reuse are reviewed along with future challenges in these areas. Since the establishment of the Agency, it has committed almost $11 billion in grants to states and communities for the construction of waste water treatment plants. The Agency has put strong emphasis on research and development activities associated with water reuse. The reuse of municipal waste water is currently being practiced on a continuing basis in 358 locations throughout the United States, chiefly in the semi-arid southwestern states. Principal applications for waste water reuse include irrigation and landscaping, industrial cooling and processing water utilization, and recreational lake maintenance. The present reuse of waste water, however, is small in relation to the amount of municipal waste water being generated, and expanded practice and continued development of municipal waste water reclamation is required. (See also W76-11257) (Kreager-FIRL)
W76-11658

A COMPUTER BASED OPERATIONAL STRATEGY FOR THE JOINT TREATMENT OF MUNICIPAL AND INDUSTRIAL WASTE-WATERS,
Houston Univ., Tex.
J. F. Andrews, and G. Olsson.
In: 3rd National Conference on Complete WateReuse, June 27-30, 1976, Cincinnati, Ohio, p 60-64. 2 fig.

Descriptors: *Waste water treatment, *Industrial wastes, *Municipal wastes, *Computer programs, *Model studies, *Simulation analysis, Treatment facilities, Biological treatment, Control systems.
Identifiers: Municipal-industrial wastes treatment, *Combined treatment.

A computer-based strategy for the combined treatment of municipal and industrial waste water is described which overcomes problems associated with the detrimental effects of certain industrial wastes on biological treatment processes. The basis of the strategy is the scheduling of batch dumps of industrial wastes so that they arrive at the treatment plant relatively unmixed with other waste water. This can be accomplished by real-time computer simulations using a dynamic model of the sewerage system. The discharge of batch industrial wastes to municipal sewers are timed in such a manner that their transport to combined treatment plants occurs when the municipal waste water flow rate is at its lowest. Upon arrival at the treatment plant, the mixture of waste waters can be diverted to a variable volume holding tank and then, depending on the characteristics of the industrial waste, be bled into the biological process over the full 24-hour period or treated by physical and/or chemical processes prior to discharge into the biological process for further treatment. (See also W76-11257) (Kreager-FIRL)
W76-11659

TRANSPORT OF CONCENTRATES AND SLUDGES,
Culp, Wesner, Culp-Clean Water Consultants, El Dorado Hills, Calif.
For primary bibliographic entry see Field 5E.
W76-11660

PROJECT CURE,
Environmental Protection Agency, Cincinnati, Ohio.
D. G. Stephan.
In: 3rd National Conference on Complete WateReuse, June 27-30, 1976, Cincinnati, Ohio, p 286-289. 1 tab, 3 ref.

Descriptors: *Waste water treatment, *Tertiary treatment, *Surface waters, *Water management(Applied), *Reclamation, *Recreation facilities, *Rivers, Channels, Lakes, Impounded waters, Artificial watercourses.

Project CURE (Clean Urban River Environments), a research proposal prepared in 1969 jointly by the Mid-Continent region of the Bureau of Outdoor Recreation and the Missouri Basin of the Federal Water Pollution Control Administration, is described. The proposed project involves the advanced treatment of waste water very near its points of use and collection followed by releases of the highly treated effluent into either natural or specially created channels and impoundments. The objective of the project is to create newly-formed rivers and lakes for water-oriented outdoor recreation and for the enhancement of the urban environment. Treatment plants are expected to be relatively small and located in or near homogeneous suburban areas at the fringes of the city. The additional costs associated with the construction of such treatment facilities are expected to be somewhat offset by the fact that extensive sewers will be unnecessary. Existing sewers could be utilized for transporting storm water runoff, and existing treatment plants could likewise be used for treating storm water runoff, thus increasing the overall quality of treated water. (See also W76-11257) (Kreager-FIRL)
W76-11661

LOWER WALLER CREEK MASTER IMPROVEMENT PLAN,
Taniguchi, Shefelman, Vackar, and Minter, Austin, Tex.
T. W. Shefelman, and A. H. Ullrich.
In: 3rd National Conference on Complete WateReuse, June 27-30, 1976, Cincinnati, Ohio, p 305-309.

Descriptors: *Water management(Applied), *Floodproofing, *Waste water treatment, *Streams, *Cities, Surface waters, Groundwater, Monitoring, Land use, *Texas, Planning.

Identifiers: Waller Creek(Tex).

A plan for improving the flow and flooding characteristics as well as water quality is proposed for lower Waller Creek which runs through the economically depressed eastern edge of the central business district in Austin, Texas. Methods being considered for supplementing flow include: drilling wells in the drainage area and discharging pumped groundwater into the channel, pumping town lake water to some upstream point and discharging it into the channel, and operating the existing municipal swimming pools in the drainage area on a flow-through basis for discharge into the creek channel. Concepts for flood control being considered include: upstream flood retarding structures, channel modifications, relocations of man-made obstacles, and flood water bypasses around bridges and possibly other channel restrictions. Plans for improving the water quality include: storm water treatment; dry weather flow water treatment; the monitoring of flows from storm sewers, gutters, and surface drains; and the pumping of town lake water for discharge into the creek at upstream points. Land use and development plans for the area are also being considered. (See also W76-11257) (Kreager-FIRL)
W76-11662

SOURCES AND POTENTIAL USES OF SALVAGEABLE WATERS IN ARIZONA URBAN REGIONS,
Arizona Water Resources Research Center, Tucson.
K. J. DeCook.
In: 3rd National Conference on Complete WateReuse, June 27-30, 1976, Cincinnati, Ohio, p 310-319. 5 tab, 12 ref.

Descriptors: *Water reuse, *Reclaimed water, *Water management(Applied), *Cities, *Deserts, Groundwater recharge, Floodproofing, Surface waters, Irrigation, Sewage treatment, Fertilizers, Nutrients, Nitrogen, Industrial wastes, Recreation facilities, *Arizona.

Symbiotic relationships which are implicit in the occurrence and potential use of salvageable waters in the desert urban environments of Phoenix and Tucson, Arizona are discussed. Treated sewage effluent can be used for crop irrigation and as a source of nitrogen for cropped lands. Satellite waste water treatment plants located in urban regional parks can relieve local overloading of the sewage collection systems and simultaneously provide a source of usable water to supplement park water requirements. Power plant blowdown can be used for groundwater recharge and irrigation of landscaped areas. The diversion of short-term peak flood flows from small urban watersheds can reduce flood danger as well as the construction cost of hydraulic structures downstream while providing supplementary water supplies for turf irrigation or recreation parks adjoining the watercourse. (See also W76-11257) (Kreager-FIRL)
W76-11663

AN EVALUATION OF THE APPLICABILITY OF PYROLYSIS-GAS-LIQUID CHROMATOGRAPHY FOR THE IDENTIFICATION OF MICROORGANISMS IN WATER AND SEWAGE TREATMENT PLANT EFFLUENTS,
National Bureau of Standards, Washington, D. C. Center for Building Technology.
For primary bibliographic entry see Field 5A.
W76-11664

EVALUATION OF TOXICITIES AND ENVIRONMENTAL IMPACT IN 'SYMBIOTIC' WATER REUSE SYSTEMS,
M. P. Kraus.
In: 3rd National Conference on Complete WateReuse, June 27-30, 1976, Cincinnati, Ohio, p 476-482. 6 tab, 4 ref.

Descriptors: *Viruses, *Toxicity, *Waste water treatment, *Water reuse, *Reclaimed water, *Bioassay, Sewage, Sludge, Irrigation, Oxidation lagoons, Sludge disposal, Sludge treatment, Radiation, Waste treatment, *Pollutant identification, Algae.

Viral assay data for various symbiotic water reuse systems are reviewed. Assays of water samples from a variety of oxidation lagoons revealed great variations in virus counts, with zero counts almost never being observed. Studies of soil treatment of dairy barn wastes showed appreciable virus removals, though the condition of the removed viruses was not determined. Considerable alteration in virus population was observed as a result of spray irrigation of domestic sewage onto woodland, with host-range, plaque-morphology patterns being significantly different than those of sewage samples. Viruses were found to abound in sludge disposed of on land, including digested or heat-treated sludge. The use of ionizing radiation for destroying viruses in sludges, treated sewage, and lagooned wastes suitable for use in certain chemical processes was also investigated, and it appears possible to regulate doses so that satisfactory treatment can be provided in some cases. However, certain strains of bluegreen algae carrying latent viruses have not proved inducible and remain very resistant to large doses of radiation. (See also W76-11257) (Kreager-FIRL)
W76-11665

DEVELOPMENT OF INSTRUMENTATION FOR A WATER PROCESSING ELEMENT,
Life Systems, Inc., Cleveland, Ohio.
G. G. See, P. Y. Yang, and R. A. Wynveen.
In: 3rd National Conference on Complete WateReuse June 27-30, 1976, Cincinnati, Ohio, p 491-501. 15 fig, 4 tab, 5 ref.

Descriptors: *Waste water treatment, *Water reuse, *Desalination, *Instrumentation, *Equipment, Reverse osmosis, Ozone, Chlorination, Oxidation, Filtration, Ion exchange, Design criteria, Potable water, Brackish water, Monitoring, Control systems.

A water processing element designed for use with transportable Army hospital is described, with particular emphasis on the instrumentation aspects of the system. The water processing element is capable of treating and disposing hospital waste water, producing water for reuse from waste water, and desalting brackish water for potable uses. The unit consists of six separate processes with control and monitoring instrumentation: equalization/prescreening, ultrafiltration, ion exchange, reverse osmosis, ozone oxidation, and hypochlorination. A discussion of instrumentation developments and approaches to the design of instrumentation is presented along with an example of the detailed instrumentation design of the ozone oxidation unit process. (See also W76-11257) (Kreager-FIRL)
W76-11666

IRRIGATION OF LEASED FARMLAND WITH TREATED WASTEWATER,
Hickok (Eugene A) and Associates, Wayzata, Minn.
N. C. Wenck, M. C. Hannaman, and R. F. Roskopf.
In: 3rd National Conference on Complete WateReuse, June 27-30, 1976, Cincinnati, Ohio, p 578-593. 13 fig, 13 tab.

Descriptors: *Water reuse, *Waste water, *Irrigation, Farms, *Recycling, Crop production, Groundwater, Water quality, Water conservation, Odor, Evaluation, Chlorides.

The results from a one-year pilot study involving the irrigation of farmland with treated waste water are presented. A total of 8.2 inches of waste water was applied to the study site in six different irrigation runs and crop samples were obtained from both irrigated and nonirrigated areas. The irrigation resulted in an increase in corn yield of 28 bushes/acre. Based on soil moisture and consumption use data, a design application rate of 12 inches/year appears feasible. The irrigation did not affect groundwater levels in the area and with the exception of chlorides, no changes in groundwater quality were detected. Chloride contamination did not appear to be serious. No complaints of odor were received from surrounding residents during the irrigation season. (See also W76-11257) (Kreager-FIRL)
W76-11667

BENEFICIAL USE OF INDUSTRIAL WASTES IN MUNICIPAL WASTEWATER TREATMENT PLANTS,
Greeley and Hansen, Chicago, Ill.
T. E. Wilson.
In: 3rd National Conference on Complete WateReuse, June 27-30, 1976, Cincinnati, Ohio, p 594-598. 3 fig, 3 tab, 14 ref.

Descriptors: *Industrial wastes, *Waste water treatment, *Organic compounds, *Metals, *Acids, Sludge treatment, Suspended solids, Biochemical oxygen demand, Heavy metals, Biological treatment, Denitrification, Chemical oxygen demand, Nitrogen, Byproducts, Treatment facilities, Phosphorus.
Identifiers: Municipal-industrial wastes.

Industrial wastes which can be used for beneficial purpose in municipal waste water treatment plants are discussed. Metal-acid wastes from industrial operations can be used for phosphorus removal, sludge conditioning, and a general improvement in suspended solids removal and biochemical oxygen demand removal in municipal waste water treatment operations. In general, the metal-acid waste should have a relatively high iron or aluminum content (about 5 and 2.5%, respectively). High concentrations of heavy metals in metal-acid wastes, however, may render these wastes unsuitable for the above purposes. High strength organic industrial wastes can be used to replace expensive raw chemicals used in biological denitrification processes. The organic waste should be preferably concentrated, with a soluble chemical oxygen demand as high as possible (over 50,000 mg/liter). The organic waste must also contain very little nitrogen. Specific examples of the use of each type of waste in waste water treatment applications are cited. (See also W76-11257) (Kreager-FIRL)
W76-11668

IRRIGATION WITH CITRUS WASTE WATER,
Agricultural Research and Education Center, Lake Alfred, Fla.
R. C. J. Koo.
The Citrus Industry, Vol. 55, No. 5, p 12, 17-19, May, 1974. 3 tab, 8 ref. OWRT A-016-FLA (4)

Descriptors: *Waste water treatment, *Industrial wastes, *Food processing industry, Citrus fruits, Irrigation, Waste water disposal, Agriculture, Fertilization, Nitrogen, Biochemical oxygen demand, Water reuse, *Florida.

To test the effects of citrus processing plant waste water on citrus trees several citrus scion-rootstock combinations were grown in a greenhouse for three years with treated waste water from two citrus processing plants in central Florida. No harmful effects were observed from the use of treated citrus waste water. Supplemental fertilization was required to sustain the trees, as the treated citrus waste water was low in nutrients. Observations of young and mature citrus trees irrigated with untreated waste water under field conditions indicated that quantity was more critical than quality of the waste water applied. Cultural practices in the grove should be modified to compensate for the change from a natural enviro

ıent. Soil in the citrus grove serves as a filtering ystem for the waste water. A marked reduction in ıe BOD, COD, and N contents were observed as ıe waste water percolated through the soil profile. he results were similar to those obtained by the eration of citrus waste water. (Murphy-FIRL)
/76-11699

/ATER RECLAMATION: TECHNOLOGY AND UBLIC ACCEPTANCE,
tone (Ralph) and Co., Inc., Los Angeles, Calif.
. Stone.
ournal of the Environmental Engineering Divi-on, Proceedings of the American Society of Civil ngineers, Vol. 102, No. EE3, Proceedings paper o. 12193, p 581-594, June 1976. 7 fig, 4 tab, 3 ref. WRT C-4030(9007)(2).

escriptors: *Economic analysis, Environmental gineering, *Public health, *Water pollution, Vater quality, *Reclamation, *Water treatment, egulation, Waste water(Pollution), Water ources, Water supply, Cost-benefit analysis, athematical models, California, Social aspects, asibility, *Waste water treatment, Technology, Vater reuse, *Attitudes.

e social, economic, and technical practicability wastewater reclamation was investigated for mestic agricultural, irrigational, recreational, l industrial reuses. Attitudes of the public in 10 uthern California case study communities vards wastewater reuse were obtained by a ran-n sample of 1,000 households from each com-nity, and socioeconomic correlates of these at-des were ascertained. The attitudes of public icials concerned with water resources and ex-ts in the field of water resources management planning were assessed on a nationwide level; the attitudes of industrial managers towards laiming wastewater were ascertained on a local uthern California) level. The influence of local able water quality parameters in affecting at-des toward reuse was analyzed. Public health other technical aspects of reclaiming waste-er were determined. Recommended treatment hods for various reuses were given. A cost-efit model was presented that can determine overall socioeconomic feasibility of reclaiming tewater for a variety of alternative uses, taking account differing local constraints likely to be ountered. (Bell-Cornell)
-11705

IONAL PLANNING FOR LAND DISPOSAL WASTEWATER,
ouri Univ., St. Louis.
. Markland, L. D. Smith, and J. D. Becker.
er Resources Bulletin, Vol. 12, No. 3, p 577-June 1976. 2 fig, 3 tab, 15 ref. OWRT C-(No. 4221)(2).

riptors: *Planning, *Land management, posal, *Waste water(Pollution), *Treatment ities, Construction costs, Operating costs, ible benefits, Land use, Sites, Decision mak-Methodology, Water policy, Simulation analy-Optimization, Constraints, Linear pro-ming, Computer programs, Design, Equa-, Systems analysis, Mathematical models, nal analysis.
ifiers: *Mixed integer programming, Mu-al waste water, St. Louis(Mo.), Cost nization, *Regional planning, Data base, d disposal.

ribed is the development and use of a mixed er programming model for the planning of disposal wastewater treatment facilities. Con-ation is given to relevant construction and ting costs for land sites, tansmission arteries, cquisition costs, tangible benefits from land controls on aquifers, and various other en-ring and technical constraints. The model is o determine which land disposal sites should which treatment plants, when initial construction should be initiated and completed, and when capacity expansion should occur. The model's application to the St. Louis Standard Metropolitan Statistical area is illustrated and discussed. The plan developed by application of the model is one which minimizes the discounted present value of relevant construction and operating costs, net of tangible ongoing benefits and net of the anticipated change in land value at the developed sites. (Bell-Cornell)
W76-11706

EVALUATION OF SOIL SYSTEMS FOR LAND DISPOSAL OF INDUSTRIAL AND MUNICIPAL EFFLUENTS,
North Carolina State Univ., Raleigh. Dept. of Soil Science.
B. L. Carlile, and J. A. Phillips.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-257 093, $5.00 in paper copy, $3.00 in microfiche. North Carolina WateResources Research Institute, Raleigh, UNC-WRRI Rpt. No. 118 July 1976. 63 p, 5 fig, 22 tab, 44 ref, 2 append. OWRT A-071-NC (2) 14-31-0001-5033.

Descriptors: *Waste water disposal, *Municipal wastes, *Industrial wastes, *Design criteria, Irrigation, Nutrients, Nitrogen, Salts, Heavy metals, Soil drainage, Vegetative cover, Hydraulics, Soil classification, Waste water treatment, Waste disposal, *North Carolina, Organic wastes.
Identifiers: *Land application, *Land disposal, Coastal Plain soil(NC).

The suitability of soils of North Carolina for application of industrial and municipal wastes was studied. In the Coastal Plain soil resource area, soil drainage is the most critical physical parameter in determining suitability of field sites for waste applications. Of the seven field sites investigated, five were located in the Coastal Plain soil resource area and two in the Piedmont soil resource area. Design loadings which can be utilized at these sites varied considerably, including hydraulic loadings of one inch per week on the Piedmont sites and up to four inches per week on the rapidly drained sands of the Coastal Plain. Organic loadings which could be successfully utilized on each site ranged from about 1100 lb/a/wk to about 4000 lb/a/wk total oxygen demanding material, again with the lower rates required on the Piedmont soils. Of the sites investigated, salt problems were responsible for more operational problems than any other design parameter. Wastewater containing up to 500 mg/l of sodium ions can be successfully applied on most field sites if either proper balances of Ca + Mg are maintained in the water or by application of soil amendments to the field. Total salt loads of up to 3000 mg/l can be applied to fescue pastures without restricting plant growth. If the above parameters as well as nutrient and heavy metal loadings are balanced to site capabilities and if sound management practices of the soil-crop, irrigation, and other operational functions followed, land application of wastewater can be a technically and economically sound system for treating waste loads at many industrial and municipal sites in North Carolina.
W76-11774

OVERLAND FLOW PRETREATMENT OF WASTEWATER,
North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering.
M. R. Overcash, D. M. Covil, J. W. Gilliam, P. W. Westerman, and F. J. Humenik.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-257 143. $6.75 in paper copy, $3.00 in microfiche. North Carolina Water Resources Research Institute, Raleigh, UNC-WRRI Rpt. No. 117, July 1976. 140 p, 16 fig, 36 tab, 51 ref. OWRT B-067-NC (2) 14-31-0001-4113

Descriptors: *Overland flow, *Pre-treatment(Water), *Nutrient removal, *Waste water treatment, *Waste treatment, Municipal wastes, Industrial wastes, *Nitrogen, Nutrients, Recycling, Farm wastes, Poultry, Agricultural runoff, Path of pollutants, Nitrification, Denitrification, Nitrates, Southeast U.S.
Identifiers: Agricultural wastes, Poultry wastes, Nutrient loading, Hydraulic loading.

Overland flow (OLF) as a pretreatment process for wastewater was studied in a three part approach: (1) an assessment of established treatment mechanisms and literature data to rank the potential uses of the OLF process for municipal, industrial, and agricultural wastes according to advantageous usage in the Southeast; (2) experimental research into nitrogen transformations occurring in OLF for poultry manure; and (3) the scale-up application of research and project results to a farm animal production level. With regard to municipal wastes, OLF was estimated to be most advantageous when used to replace secondary treatment followed by direct stream discharge or by advanced treatment. Benefits were also derived when OLF was used as secondary treatment prior to terminal land application. The OLF study of nitrogen transformations for poultry manure indicated the largest N pathway was the unaccounted for losses which include nitrification-denitrification and ammonia volatilization (50-70 percent of influent N). Grass uptake was 5-20 percent, and conversion to nitrate in the effluent liquid was 5-10 percent of the influent N. The smallest pathways (1-3 percent) were the soil-water percolation beyond 2.4 m depth and rainfall runoff losses. Similar levels of total N losses were achieved for 1670 kgN/ha./yr and 2970 kgN/ha./yr; for hydraulic loadings of 4/cm/week and 7.6 cm/week; and for rest periods of 22 hours and 46 hours. Nitrogen losses increased from 50-65 percent after 15 m of flow to 70-80 percent after 30 m of flow distance. Increased rest periods and lower waste application rates favored larger nitrification potential. (Stewart-North Carolina State)
W76-11775

REMOVAL OF UNDESIRABLE CATIONS FROM ACID MINE WATER BY A NEW CATION-EXCHANGE MATERIAL,
West Virginia Univ., Morgantown. Water Research Inst.
J. H. Strohl, and J. L. Hern.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-257 092, $3.50 in paper copy, $3.00 in microfiche. Information Report 9, 1976. 14 p, 6 fig, 3 tab, 2 ref. OWRT A-030-WVA(1), 14-34-0001-6051.

Descriptors: *Acid mine water, *Cation exchange, *Electrode, *Waste water treatment, *Water treatment, Chelation, Chemical analysis, Cost, Demineralization, Ion exchange, Mine acids, Mine water, Treatment, Water pollution, Water quality.
Identifiers: Cation exchange medium, Graphite, Electrogeneration, Metal-ion pollutants, Sulfonated graphite.

This study is directed toward the development of material and methods useful for removing metal-ion pollutants from water. Several modified graphites were prepared that had ion-exchange or chelating properties capable of removing Fe(+3), Ni(+2), Co(+2), Mg(+2), and Ca(+2) from water. The absorption capacities of these modified graphites are too low for economical use in water treatment. They are useful for analytical separations, however. Attempts at producing materials with higher absorption capacities were unsuccessful. Adjustment of pH and removal of some metal ions as the hydroxides by the electrogeneration of base appear to be a practical process for large-scale water treatment.
W76-11776

ENVIRONMENTAL IMPACT ASSESSMENT, WATER QUALITY ANALYSIS, YADKIN - PEE DEE RIVER BASIN,
TRW, Inc. Redondo Beach, California.
For primary bibliographic entry see Field 5G.
W76-11781

WATER POLLUTION CONTROL ACT OF 1972, ENVIRONMENTAL IMPACT ASSESSMENT, POTOMAC RIVER.
Academy of Natural Sciences, Philadelphia, Pa.
For primary bibliographic entry see Field 5G.
W76-11782

WATER QUALITY ANALYSIS, SNAKE RIVER, IDAHO.
Tetra Tech, Inc., Lafayette, Calif.
For primary bibliographic entry see Field 5G.
W76-11783

WATER POLLUTION CONTROL ACT OF 1972, ENVIRONMENTAL IMPACT ASSESSMENT, SNAKE RIVER.
Parametrix, Inc., Seattle, Wash.
For primary bibliographic entry see Field 5G.
W76-11784

WATER QUALITY ANALYSIS, UPPER RIO GRANDE.
Water Resources Engineers, Inc., Austin, Tex.
For primary bibliographic entry see Field 5G.
W76-11785

WATER POLLUTION CONTROL ACT OF 1972, ENVIRONMENTAL IMPACT ASSESSMENT, IOWA-CEDAR RIVER BASIN.
Midwest Research Inst., Minneapolis, Minn. North Star Research Div.
For primary bibliographic entry see Field 5G.
W76-11786

ENVIRONMENTAL IMPACT ASSESSMENT, WATER QUALITY ANALYSIS, J. PERCY PRIEST RESERVOIR.
Vanderbilt Univ., Nashville, Tenn. Dept. of Environmental and Water Resources Engineering.
For primary bibliographic entry see Field 5G.
W76-11787

ENVIRONMENTAL IMPACT ASSESSMENT, WATER QUALITY ANALYSIS, UTAH LAKE - JORDAN RIVER BASIN.
Environmental Dynamics, Inc., Los Angeles, Calif.
For primary bibliographic entry see Field 5G.
W76-11788

ENVIRONMENTAL IMPACT ASSESSMENT, WATER QUALITY ANALYSIS, LOWER MISSOURI RIVER BASIN.
Midwest Research Inst., Kansas City, Mo.
For primary bibliographic entry see Field 5G.
W76-11790

WATER POLLUTION CONTROL ACT OF 1972, ENVIRONMENTAL IMPACT ASSESSMENT, UPPER MISSISSIPPI RIVER BASIN,
Midwest Research Inst., Minneapolis, Minn. North Star Research Div.
For primary bibliographic entry see Field 5G.
W76-11791

WATER PURIFICATION APPARATUS,
F. G. Mayer.
U.S. Patent No. 3,957,589, 4 p, 5 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 946, No 3, p 1214, May 18, 1976.

Descriptors. *Patents, *Water purification, *Water treatment, *Distillation, *Water pollution treatment, Water quality control, *Condensation, Steam, Cooling, Equipment condensers, *Waste water treatment.

A water purifying apparatus has an inner chamber to be filled with contaminated water which is heated by a heating unit to a point where water vapor or steam is created. The steam is evacuated from the chamber at its upper portion and passes downward in contact with a condensing wall having cooling vanes on its exterior into a trough provided near the base of the apparatus. Water is drained off into a container located below the chamber. A cover surrounds the cooling vanes forming an annular air passage and is so constructed that open areas exist near the base of the cover. The cover has an aperture on top and a fan is placed below the aperture. Cooling air is carried from the open areas near the base of the apparatus upward over the vanes and to the aperture at the top where it is continuously evacuated. With this structure the vanes are continuously cooled without affecting the heating operation in the chamber itself. Pure water is obtained from the condensed steam in a rapid and efficient manner. (Sinha-OEIS)
W76-11832

WASTE-WATER PURIFICATION,
Sterling Drug Inc., New York. (Assignee).
P. V. Knopp, and W. B. Gitchel.
U.S. Patent No. 3,957,632, 6 p, 2 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 946, No 3, p 1227, May 18, 1976.

Descriptors: *Patents, *Waste water treatment, Water pollution treatment, *Sewage treatment, Organic wastes, Adsorption, *Activated carbon, Oxygen, Nitrification, *Denitrification, *Activated sludge, Anaerobic conditions.

The process of simultaneous removal of organic carbonaceous material and biological oxidation of the reduced nitrogenous forms in waste-waters followed by subsequent reduction of the oxidized nitrogen to elemental nitrogen is comprised of the following steps: waste-water containing ammoniacal nitrogen is fed into a vessel containing a developing active biomass having a sludge age of at least about three days; an aqueous suspension of powdered activated carbon is introduced simultaneously with the addition of a non-condensible oxygen containing gas; aerobic conditions are maintained for at least one hour to substantially oxidize ammoniacal nitrogen to nitrite or nitrate nitrogen; the powdered activated carbon, associated adsorbed organic material and biological solids are settled and separated and returned to the inlet end; the liquid phase is passed to an anaerobic zone containing denitrifying organisms to which further powdered activated carbon and organic carbon is added so that oxidized nitrogen forms are reduced to elemental nitrogen and solids accumulate; the mixture is passed to a quiescent zone where the powdered activated carbon and associated organic material are substantially removed from the wastewater; and the effluent is removed. (Sinha-OEIS)
W76-11834

SEWAGE TREATMENT METHOD AND APPARATUS,
ITT Industries, Inc., New York. (Assignee).
G. Gatti, and H. Fries.
U.S. Patent No. 3,957,633, 4 p, 3 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 946, No 3, p 1228, May 18, 1976.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, Water pollution treatment, *Aeration, Pumps, Pumping plants, Conduits, Equipment, Flow.

A method and apparatus is provided for aerating sewage water in a tank such as a sewage water pump station. A pump is mounted in the tank with its inlet submerged in the sewage water. A conduit is connected to the outlet of the pump for providing flow communication between the pump and an outlet pipe of the tank. Sewage aeration is provided in the conduit. This aeration includes an air intake pipe which has an inlet outside of the tank allowing air to be drawn into the conduit. The conduit includes means for directing the flow of sewage water from the pump through the aeration means back into the tank. In addition, such means is shiftable to a position allowing flow of sewage water from the tank to the outlet pipe for transport to an additional pump station. As a consequence, a single pump is utilized for both aerating the sewage water and transporting it from one station to the next. (Sinha-OEIS)
W76-11835

SPHINCTER CONE ASSEMBLY FOR PURIFYING WATER,
For primary bibliographic entry see Field 5F
W76-11839

SOME ASPECTS OF MODELLING THE LONG TERM BEHAVIOUR OF AQUATIC ECOSYSTEMS,
Technical Univ. of Denmark, Lyngby. Inst. of Mathematical Statistics and Operations Research.
For primary bibliographic entry see Field 5B.
W76-11883

AN ECOLOGICAL MODEL FOR HEAVY METAL CONTAMINATION OF CROPS AND GROUND WATER,
Royal Danish School of Pharmacy, Copenhagen.
For primary bibliographic entry see Field 5B.
W76-11885

CITY–INDUSTRY TEAMWORK SOLVES CRITICAL WASTEWATER PROBLEM,
For primary bibliographic entry see Field 5G.
W76-11891

THE SEPTIC TANK--A METHOD OF SEWAGE DISPOSAL FOR PRIVATE OR PUBLIC BUILDINGS,
Arizona State Dept. of Health Services, Phoenix. Engineering Bulletin No 12, June 1971. 22 p, plates, 3 tab.

Descriptors: *Arizona, *Septic tank, *Legislation, *Design standards, *Sewerage, Sewage disposal, Waste disposal, Sewage treatment, Wastes, Disposal, Environmental sanitation, Sanitary engineering, Specifications, Structural design, Administration, Regulation, Maintenance, Operation and maintenance, Sewage sludge, Leaching, Digestion, Treatment facilities.

This bulletin sets forth the applicable standards for septic tank construction in Arizona. The principles governing the operation of septic tanks are discussed to acquaint interested persons with the need and purposes behind the standards. Before any septic tank construction may begin, approval of the design and installation of the septic tank disposal system is necessary. Site conditions and percolation tests are important considerations influencing approval. Once the system is approved, certain specifications must be followed in the design and construction of the septic tanks. Two types of leaching systems which can be used are also discussed. Once the system is ready for service, the digestion process will begin automatically with the introduction of suitable bacteria. After operation begins, the accumulated sludge and scum in the system should be cleaned out regularly. (Hadoulias-Florida)
W76-11892

MINIMUM REQUIREMENTS FOR DESIGN, UBMISSION OF PLANS AND SPECIFICA-IONS OF SEWAGE WORKS.
rizona State Dept. of Health Services, Phoenix.
rizona State Department of Health Engineering ulletin No 11, September 1970. 43 p.

escriptors: Facilities, *Legislation, *Design stan-ards, *Arizona, *Sewage treatment, Sewage sposal, Waste disposal, Wastes, Sewerage, ewers, Disposal, Environmental sanitation, Sani-ry engineering, Sewage sludge, Pumping plants, udge, Primary treatment, Secondary treatment, ewage sludge treatment, Structural design, Con-ruction, Administration, Specifications, Regula-on, *Treatment facilities.

e Arizona State Board of Health has promul-ted rules and regulations governing the design, nstruction and operation of sewerage systems d waste treatment works. This bulletin is in-ded to serve as a guideline to those rules, and to orm those persons designing and submitting ns for sewerage and industrial waste collection atment and disposal systems. The bulletin sets th the minimum standards acceptable for plans d specifications submitted to the State Depart-nt of Health. The guidelines include a descrip-n of the types of factual data that must be in-ded in the plans submitted for approval. The ign structures which must be included in sewer tems and sewerage pumping stations are set th along with specifications for plant layouts, nt detail, plant facilities, and construction. Also forth are procedures relating to various treat-nt methods including primary, secondary, dge digestion and disposal, disinfection, odor trol and stabilization ponds. If the standards tained in this bulletin are followed, compliance n the pertinent rules and regulations will be as-ed. (Hadoulias-Florida)
5-11893

ERIM REPORT, COOPERATIVE GRAYS RBOR SURVEILLANCE PROGRAM-1970,
shington State Dept. of Ecology, Olympia. Of-of Technical Services.
. Cunningham.
mpia, Washington (June 1971). 32 p, 11 fig, 3 3 append.

criptors: *Washington, *Biochemical oxygen and, *Dissolved oxygen, *Pulp wastes, hkill, Oxygen sag, Chemical wastes, Industrial es, Water pollution sources, Water pollution cts, Water pollution treatment, Water quality rol, Water quality standards, Data collections. tifiers: Hazardous substances.

use of a history of low dissolved oxygen (DO) entrations in Grays Harbor, Washington, the Department of Ecology has required local industries to improve waste treatment facili-A study was also commissioned to determine O concentrations before and after utilization e facilities. This report concentrates on the re' studies in 1970. The results show that dur-ie summer and fall of 1970 DO concentration low, being substandard for all but six days g August, September and October. During of the period a high correlation existed een the exerted BOD and the harbor's DO nse. Many times during the low flow period sampling was done the total discharged BOD ded 150,000 to 200,000 pounds per day. Since ew treatment facilities are intended to reduce ischarge to 80,000 pounds per day, calcula-indicate that an average daily reduction of) pounds would result, with an expected reable increase in DO. (Comer-Florida)
1894

NOMYCETES OF SEWAGE-TREATMENT TS,
rs - The State Univ., New Brunswick, N.J. nan Inst. of Microbiology.
Lechevalier.

Available from the National Technical Information Service, Springfield, Va 22161, as PB-245 914, $4.50 in paper copy, $3.00 in microfiche. Environmental Protection Agency, Environmental Protection Technology Studies Series No. EPA-600/2-75-031, September 1975. 62 p, 23 tab, 19 ref. R-802003.

Descriptors: *Actinomycetes, *Sewage treatment, *Activated sludge, *Aeration, *Waste water treatment, *Pollution abatement, Water pollution, Microbiology, Foaming, Water quality control.
Identifiers: Nocardia amarae.

In some sewage-treatment plants of the activated sludge type, a thick foam may be formed at the surface of the secondary aeration and settling tanks. Such foams have often been found to be rich in actinomycetes. This report covers the work done on this problem between April 1971 and May 1974. Over 250 strains of actinomycetes have been isolated from foams or activated sludge from 19 different sewage-treatment plants located in 8 states. The actinomycete most commonly associated with foams is a previously undescribed Nocardia which has been given the name N. amarae. It has been demonstrated experimentally in the laboratory that N. amarae may cause the kind of foam observed in the plants. Factors affecting the growth of N. amarae have been studied and a method was proposed for control of the foam by addition of digester supernatant to the activated sludge. (Sinha-OEIS)
W76-11927

SURVEY STUDY OF TECHNIQUES TO PREVENT OR REDUCE DISCHARGES OF HAZARDOUS CHEMICALS,
Battelle Columbus Labs., Ohio.
For primary bibliographic entry see Field 5G.
W76-11931

PRELIMINARY RESULTS WITH A PILOT PLANT WASTE RECYCLING MARINE-AQUACULTURE SYSTEM,
Woods Hole Oceanographic Institution, Mass.
J. H. Ryther.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-247 182, $4.50 in paper copy, $3.00 in microfiche. Technical Report No. WHOI-75-41, September 1975. 31 p, 11 fig, 5 tab, 6 ref. 04-4-158-5; 04-5-158.

Descriptors: *Aquiculture, *Recycling, *Pilot plants, *Shellfish farming, *Fish farming, *Sewage effluent, *Pollution abatement, Algae, Waste water disposal, Mollusks, Fish, Water reuse.
Identifiers: Seaweeds.

A combined waste recycling-marine aquaculture system capable of complete nitrogen removal from treated domestic wastewater was developed and tested on a pilot-plant scale over a one-year period. Effluent from secondary sewage treatment, mixed with seawater was used to grow unicellular marine algae in large, continuos-flow, outdoor mass cultures. Harvest from the algae cultures was fed to oysters and other filter-feeding bivalve molluscs and to secondary crops of flounder or lobsters. Dissolved wastes produced by the animals were assimilated by cultures of commercially-valuable seaweeds. Successful cultures of unicellular algae, mostly diatoms, and seaweeds were sustained over long periods of time (months) with only minor problems. Algal yields and nitrogen removal capacity varied seasonally by 3-4 fold and were controlled by solar radiation but not by temperature. Assuming that problems with shellfish culture can be resolved, a combined unicellular algae-shellfish-seaweed system is capable of complete nitrogen removal from wastewater effluent within an area of 48 acres and with an estimated annual production of 183 tons of oyster meat, 3,350 tons wet weight of seaweeds and undetermined quantities of flounder and/or lobsters per MGD effluent treated (wastes per 10,000 capita). A seaweed system alone is capable of nitrogen removal in an area of 60 acres with annual production of 16,300 tons wet weight of seaweeds. (Sinha-OEIS)
W76-11932

A STUDY OF THE EFFECTS OF DETERGENTS ON TYPICAL BILGE WATERS AND CORRELATION OF OIL PARTICLE SIZES,
General Electric Co., Philadelphia, Pa. Re-Entry and Environmental Systems Div.
For primary bibliographic entry see Field 5C.
W76-11939

RECHARGE OF RECLAIMED WASTE WATER: RESEARCH NEEDS,
Texas A and M Univ., College Station. Dept. of Civil Engineering.
In: Proceedings, Tenth Biennial Conference on Ground Water, September 11-12, 1975. Ventura, California, p 76-87. 2 tab, 35 ref. OWRT B-146-TEX(3).

Descriptors: *Reclaimed water, *Recharge, *Water reuse, Water chemistry, *Trace elements, Arsenic, Cadmium, Chromium, Copper, Iron, Mercury, Manganese, Nickle, Lead, Selenium, Strontium, Zinc, *Activated sludge, *Nitrification, Texas, California, Research priorities, *Waste water treatment, Metals.
Identifiers: Carcinogenic compounds, Tumorigenic agents, Nitrifying bacteria, Heterotrophic bacteria, Dallas(Tex), Trace metals.

Certain compounds and metals have been observed to demonstrate carcinogenic properties. Recognition that factors in the environment could be responsible for the initiation of tumors could incriminate both food and water as major sources of environmental tumorigenic substances. Trace metals contained in reclaimed waste water are among the substances under study. A study was done at Dallas, Texas examining metal removal by various advanced waste treatment (AWT) processes. The basic biological process used was nitrifying an activated sludge system. Metal removal is enhanced by a nitrifying system and fewer bacterial viruses are also present. The nitrified operation has a much more immediate role in the recharge situation. The amount of dilution waters presently required could be substantially reduced by conversion of waste treatment plants to highly nitrified operations. (Heiss-NWWA)
W76-11959

EFFLUENT LIMITATIONS GUIDELINES FOR EXISTING SOURCES AND STANDARDS OF PERFORMANCE AND PRETREATMENT STANDARDS FOR NEW SOURCES FOR THE PAVING AND ROOFING MATERIALS (TARS AND ASPHALT) POINT SOURCE CATEGORY.
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-11989

INORGANIC CHEMICALS MANUFACTURING POINT SOURCE CATEGORY.
Environmental Protection Agency,Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-11992

OFFSHORE SEGMENT OF THE OIL AND GAS EXTRACTION POINT SOURCE CATEGORY.
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-11994

RECYCLE--REUSE, INFALL--OUTFALL, DECISIONS CONFRONT SCIENCE, PUBLIC,
Central and Southern Florida Flood Control District, West Palm Beach.
J. Browning.
In Depth Report, Vol 1, No 6, p 1-12, June 1972. 12 p, 1 fig, 3 tab.

Descriptors: *Water districts, *Recycling, *Waste storage, *Waste treatment, *Aquifers, Activated sludge, Aeration, Tertiary treatment, Geologic formations, Wastewater treatment, Freshwater, Water pollution treatment, Groundwater, Groundwater resources, *Water reuse.

Set forth in this guide book is background material designed to help the atechnical person understand the difference between recycling and reuse and the problem of continuous ocean waste discharge. Also described is the use of models for predicting seawater encroachment on freshwater aquifers. New methods of wastewater treatment include injection into deep, unused geologic formations, extended aeration, and activated sludge processes. Secondary processes may not kill viruses in wastewater, and, therefore, tertiary processes may be required. Tables indicate constituent removals by various wastewater reclamation projects as well as costs for each. Decision must be made as to the future course of wastewater treatment, since society may not be willing to bear the cost of 100% pollution free water. (Frank-Florida)
W76-12001

POLLUTION CONTROL IN MEAT, POULTRY AND SEAFOOD PROCESSING,
H. R. Jones.
Noyes Data Corporation: Park Ridge, New Jersey; London, England. 1974. 263 p, Pr. $36.00.

Descriptors: *Food processing industry, *Poultry, *Pollution abatement, Water pollution control, *Waste water treatment, *Industrial wastes, Biodegradation, Patents, Air pollution, Odor, Nitrogen.
Identifiers: *Seafood processing, *Meat processing.

This book deals primarily with wastewater treatment and pollution reduction for the meat processing, the poultry processing and the seafood processing industries. Animal slaughtering and meat processing produce a highly loaded, but biologically degradable, wastewater containing dissolved suspended and dispersed fibrous animal matter with high nitrogen content. It also creates serious air pollution and odor removal problems. Poultry and seafood wastes have similar problems. Condensed data from government sources are coordinated and important pollution removal processes are interpreted and explained by examples from recent USA patents. The table of contents serves as a subject index and bibliographies are included with each section. A special section is devoted to future trends and recommendations. Other indexes by company, inventor and patent number help to provide access to the information.--Copyright 1974, Biological Abstracts, Inc.
W76-12146

DESIGNING POST-CHLORINATION BY CHEMICAL REACTOR APPROACH,
Southern Illinois Univ., Edwardsville. Dept. of Urban and Environmental Engineering.
P. Kokoropoulos.
J Water Pollut Control Fed. 45(10); p 2155-2165, 2241, 1973.

Descriptors: *Chlorination, *Waste water treatment, *Water treatment, *Treatment facilities, Design, Bacteria, Disinfection.
Identifiers: *Post-chlorination, *Chemical reactors.

Chemical reaction engineering concepts can be applied in the analysis and design of post-chlorination facilities. The post-chlorination process can be considered as a multicomponent, open system, where several parallel, competing reactions occur simultaneously but at different rates. The proposed design is a multiple-reactor system of backmix stages in series. The number of stages and the holding times are chosen so that the system approaches plug-flow conditions. Calculations show that multiple backmix reactor systems exhibit high conversion efficiencies (99.9% bacterial kill), at reasonable holding times and are readily amenable to expansion by additional stages. Typical examples of application of the design in post-chlorination are given.--Copyright 1974, Biological Abstracts, Inc.
W76-12150

5E. Ultimate Disposal Of Wastes

THE ENVIRONMENTAL AND SOCIOLOGICAL IMPACT OF RECYCLING OF AGRICULTURAL WASTE BY LAND USE,
Green Valley Farms, Avondale, Pa.
For primary bibliographic entry see Field 5D.
W76-11641

EXPERIENCE WITH LAND APPLICATION OF WASTEWATER AND STATE REGULATIONS - THE PENNYPACK WATERSHED,
Martin (A. W.) Associates, Inc., King of Prussia, Pa.
For primary bibliographic entry see Field 5D.
W76-11642

EXPERIENCE WITH LAND APPLICATION OF WASTEWATER AND STATE REGULATIONS - PENNYPACK WATERSHED-PENNSYLVANIA,
Pennypack Watershed Association, Bryn Athyn, Pa.
For primary bibliographic entry see Field 5D.
W76-11643

LAND DISPOSAL OF WASTEWATER IN THE COMMONWEALTH OF PENNSYLVANIA - A REGULATORY VIEW,
Pennsylvania Department of Environmental Resources, Harrisburg. Burea of Water Quality Management.
For primary bibliographic entry see Field 5D.
W76-11644

COMPUTER AIDED PLANNING OF A REGIONAL DISPOSAL SYSTEM FOR MUNICIPAL SLUDGE,
B and P Engineers, Kitchener (Ontario).
For primary bibliographic entry see Field 5D.
W76-11647

TRANSPORT OF CONCENTRATES AND SLUDGES,
Culp, Wesner, Culp-Clean Water Consultants, El Dorado Hills, Calif.
W. F. Ettlich.
In: 3rd National Conference on Complete WateReuse, June 27-30, 1976, Cincinnati, Ohio, p 140-146. 11 fig, 3 tab.

Descriptors: *Cost comparisons, *Cost analysis, *Sludge, *Transportation, Pipelines, Railroads, Barges, Costs, Economics, Evaluation, Waste disposal.
Identifiers: Trucks.

A cost analysis of various sludge transport methods is presented. The total annual cost for the transport of dewatered sludge by railroad is less than that associated with truck transport, although railroad facilities are more capital intensive than truck facilities. Truck is the least expensive mode for liquid sludge transport over one-way distances of 20 miles or less and for sludge volumes less than 10-15 million gallons/year. Pipeline is the least expensive transport mode when the annual sludge volume is greater than approximately 30-70 million gallons, depending on distance. Pipeline is not economically attractive for annual sludge volumes of 10 million gallons or less because of the high capital investment. Rail and barge are comparable over the 7-700 million gallon volume range for long haul distances. Barge is more economical than rail for short to medium distances and for annual sludge volumes greater than 30 million gallons. (See also W76-11257) (Kreager-FIRL)
W76-11660

GROUND-WATER QUALITY AT THE SITE OF A PROPOSED DEEP-WELL INJECTION SYSTEM FOR TREATED WASTEWATER, WEST PALM BEACH, FLORIDA,
Geological Survey, Tallahassee, Fla
For primary bibliographic entry see Field 5A.
W76-11681

IRRIGATION WITH CITRUS WASTE WATER,
Agricultural Research and Education Center, Lake Alfred, Fla.
For primary bibliographic entry see Field 5D.
W76-11699

REGIONAL PLANNING FOR LAND DISPOSAL OF WASTEWATER,
Missouri Univ., St. Louis.
For primary bibliographic entry see Field 5D.
W76-11706

EVALUATION OF SOIL SYSTEMS FOR LAND DISPOSAL OF INDUSTRIAL AND MUNICIPAL EFFLUENTS,
North Carolina State Univ., Raleigh. Dept. of Soil Science.
For primary bibliographic entry see Field 5D.
W76-11774

EVALUATION OF SLUDGE DUMPING OF DELAWARE BAY,
Delaware Univ., Lewes. Coll. of Marine Studies.
For primary bibliographic entry see Field 5B.
W76-11792

UNDERGROUND LIQUID WASTE DISPOSAL,
American Society of Civil Engineers, New York. Task Committee on Underground Liquid Disposal.
D. L. Warner.
Journal of the Hydraulics Division, American Society of Civil Engineers Proceedings, Vol. 101, No. HY3, Proceedings paper No. 11191, p 421-439, March 1975. 10 tab, 18 ref.

Descriptors: *Deep wells, *Hydraulics, *Injection wells, *Wells, Injection, Brines, Wastewater disposal, Waste water treatment, Water policy.
Identifiers: Environmental impact.

As of mid-1973, at least 278 industrial wastewater injection wells had been constructed in 24 states. Statistics concerning these wells are presented and their environmental impact appraised. A few states have specific laws and regulations concerning such wells, but most states use existing general statutes. Straight-line projections would indicate that about 614 wells will have been constructed by 1985 and 1,034 by 2000. Brine wastes are the most likely to continue to be injected in the future. It is estimated that strict interpretation of present Federal law would cause the production of more than 200 mgd of brine that would require disposal by injection or other means as compared with 90 mgd that was being injected in 1973. The policies and procedures adopted by ORSANCO are suggested as a model for others to consider. (Bell-Cornell)
W76-11888

Y--INDUSTRY TEAMWORK SOLVES ITICAL WASTEWATER PROBLEM,
primary bibliographic entry see Field 5G.
6-11891

E SEPTIC TANK--A METHOD OF SEWAGE POSAL FOR PRIVATE OR PUBLIC LDINGS,
ona State Dept. of Health Services, Phoenix.
primary bibliographic entry see Field 5D.
-11892

IMUM REQUIREMENTS FOR DESIGN, MISSION OF PLANS AND SPECIFICA-NS OF SEWAGE WORKS.
ona State Dept. of Health Services, Phoenix.
primary bibliographic entry see Field 5D.
-11893

UDY OF THE EFFECTS OF DETERGENTS TYPICAL BILGE WATERS AND COR-ATION OF OIL PARTICLE SIZES,
ral Electric Co., Philadelphia, Pa. Re-Entry Environmental Systems Div.
rimary bibliographic entry see Field 5C.
11939

ONAL POLLUTANT DISCHARGE INATION SYSTEM: SEPARATE STORM ERS.
onmental Protection Agency, Washington,

rimary bibliographic entry see Field 5G.
1993

CLE--REUSE, INFALL--OUTFALL, DECI-S CONFRONT SCIENCE, PUBLIC,
l and Southern Florida Flood Control Dis-Vest Palm Beach.
imary bibliographic entry see Field 5D.
2001

DISCHARGE: NATIONAL GOAL OR NA-L CALAMITY,
Chemical Corp., New York.
mary bibliographic entry see Field 5G.
2014

Water Treatment and ality Alteration

TRUCTION SAFETY IN WATERWORKS,
uction Safety Association of Ontario,
, Ontario.
cKnight.
ual Conference Proceedings of the Ontario of the American Water Works Associa-llution Control Association Ontario, and Municipal Water Association, April 20-23, oronto, Ontario, p 321-325.

tors: *Safety, *Accidents, *Construction, ent facilities, *Water treatment, Educa-gislation, Organizations, Canada.
rs: Ontario, Construction safety act.

s being taken in Ontario, Canada, to safety during the construction of water re reviewed. The Construction Safety Act governs all installation, rennovation, and tivities except those covered by the Min-The Act specifies personal protective nt that must be worn by workers on any hat changes the physical structure or ap-of a building, equipment, or machinery. struction Safety Association of Ontario area counselors who actively promote ac-revention and develop educational pro-r contractors and their employees. The and Development Section of the As-sociation investigates accident causes and provides statistical information on accident occurence. (See also W76-11249) (Kreager-FIRL)
W76-11651

SAFETY IN WATER AND WASTEWATER PLANTS,
Ontario Ministry of the Environment (Toronto).
For primary bibliographic entry see Field 5G.
W76-11652

WATER PURIFICATION APPARATUS,
For primary bibliographic entry see Field 5D.
W76-11832

WATER TREATMENT DEVICE WITH TRANSISTORIZED CIRCUIT,
Water Technology Service, Inc., Cleveland, Ohio. (Assignee).
H. S. Aber, D. D. Riggs, and J. Lamantia.
U.S. Patent No. 3,957,617, 4 p, 6 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 946, No 3, p 1223, May 18, 1976.

Descriptors: *Patents, *Water treatment, *Demineralization, *Hardness(Water), Water softening, Scaling, Electric currents, Electric fields.

A fluid treatment apparatus is comprised of a fitting having inlet and outlet passages for coupling in a flow line. The fitting defines an electrically conductive bell-shape housing having inlet and outlet chambers and a perforated electrically conductive screen insulatively supported between the chambers. An electric potential is applied between the electrically conductive bell-shaped housing and the electrically conductive screen. The electric field established between the screen and fitting affects the water flowing through the fitting to eliminate the mineral and other deposits already accumulated in the downstream water system and prevents further accumulation. (Sinha-OEIS)
W76-11833

SPHINCTER CONE ASSEMBLY FOR PURIFYING WATER,
B. B. Barefoot.
U. S. Patent No. 3,957,655, 3 p, 6 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 946, No 3, p 1236, May 18, 1976.

Descriptors: *Patents, *Water treatment, *Water purification, *Water pollution treatment, Water pollution control, Water quality control, Suspended solids, Turbulence, Mixing, Equipment, *Waste water treatment.
Identifiers: *Sphincter cones, Particulates.

The sphincter cone is a water treatment and clarification vessel which contains no moving parts. The return or recirculated water is introduced into the cone through the surge tank located at the top center of the cone and having an open bottom. The surge tank nullifies turbulence of the incoming water. From here the water is driven out of the bottom of the surge tank and rises upward and radially outward from the center of the cone towards the outside circumferential sump formed between the inner circular wall and the outer wall. The bottom 6 feet of the circumferential sump is pitched or inclined downward toward the outlet pipe. This construction combined with the settling velocities of the descending suspended particulate directed towards the outlet serves to very adequately remove the solids from the water. The water is then drained in its clarified state away from the cone through the outlet pipe and is then ready for recirculation or return to the sewage system or streams. Should the water require more than simple clarification, then the sphincter cone can serve as a water treatment vessel whereby the chemical additives are introduced upstream of the surge tank and through the turbulence in the surge tank, are thoroughly mixed and dispersed throughout the entire volume of water, thus resulting in uniform water treatment. (Sinha - OEIS)
W76-11839

REVIEW OF PROJECTS AFFECTING SOLE SOURCE AQUIFERS, EDWARDS UNDERGROUND RESERVOIR, TEXAS AREA; INTERIM PROJECT REVIEW GUIDELINES.
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-11991

DESIGNING POST-CHLORINATION BY CHEMICAL REACTOR APPROACH,
Southern Illinois Univ., Edwardsville. Dept. of Urban and Environmental Engineering.
For primary bibliographic entry see Field 5D.
W76-12150

5G. Water Quality Control

WATER POLLUTION CONTROL: CROSSROADS OF A MUNICIPAL FINANCIAL DILEMMA,
North Texas State Univ., Denton. Dept. of Administrative Sciences and Marketing.
For primary bibliographic entry see Field 5D.
W76-11626

REMOTE CONTROL OF COMBINED SEWER OVERFLOWS,
Watermantion, Inc., Saint Paul, Minn.
For primary bibliographic entry see Field 5D.
W76-11630

EPA GUIDANCE AND POLICY ON LAND TREATMENT,
Environmental Protection Agency, Washington, D. C. Office of Water Programs.
For primary bibliographic entry see Field 5D.
W76-11638

PUBLIC HEALTH ASPECTS OF LAND APPLICATION OF WASTEWATER EFFLUENTS,
Army Medical Bioengineering Research and Development Lab., Fort Detrick, Md.
For primary bibliographic entry see Field 5D.
W76-11639

EDUCATIONAL AND INFORMATIONAL NEEDS FOR ACHIEVING PUBLIC ACCEPTANCE,
Purdue Univ., Lafayette, Ind. Cooperation Extension Service.
J. O. Dunbar.
In: Land Application of Wastewater, November 20-21, 1974, Newark, Delaware, p 35-38. 3 ref.

Descriptors: *Waste water disposal, *Sludge disposal, *Recycling, *Information exchange, *Education, *Attitudes, *Waste treatment, Phychological aspects, Political aspects, Social aspects.

An educational and informational program is proposed for gaining public acceptance of the idea of recycling urban effluents and sludges to the land. The program is outlined in terms of necessary behavioral changes required, educational methods for achieving attitude changes, and means for communicating information on the subject. The program is divided into four parts corresponding to the following types of audiences: the general public, decision makers and others concerned with environment and waste treatment, people with vested interests that will be significantly affected by waste recycling, and professionals from government agencies who work closely with people affected by the decision. (See also W76-11231) (Kreager-FIRL)

W76-11640

ENVIRONMENTAL ASSESSMENT: A PLANNING TOOL,
Ontario Ministry of the Environment, Toronto. Environmental Approvals Branch.
For primary bibliographic entry see Field 6G.
W76-11649

THE GREAT LAKES AGREEMENT - A MID-TERM PERSPECTIVE,
Department of the Environment, Ottawa (Ontario). Liaison and Coordination Directorate.
R. M. Robinson.
In: Annual Conference Proceedings of the Ontario Section of the American Water Works Association, Pollution Control Association of Ontario, and Ontario Municipal Water Association, April 20-23, 1975, Toronto, Ontario, p 161-178.

Descriptors: *Legislation, *Great Lakes, *Water pollution control, *Canada, *United States, Municipal wastes, Legal aspects, Waste treatment, Nutrients, Surface waters, International Joint Commission, Water law, Monitoring, Institutions.
Identifiers: Great Lakes Water Quality Agreement.

The development and implementation of the Great Lakes Water Quality Agreement of 1972 is reviewed. The agreement which sets out objectives and commitments of the United States and Canada regarding the protection of the water quality of the Great Lakes also identifies programs needed to achieve these objectives, establishes institutional mechanisms required to make the agreement as self-policing as possible, and creates a constant review process. An International Joint Commission is responsible for monitoring the progress on both sides and for reporting the results to the governments as well as the public. Canadian programs for installing municipal waste treatment facilities and controlling nutrient inputs are currently near to meeting the goals established in 1972. Significant progress is also being made by the United States, although adequate municipal waste treatment facilities presently serve only 60% of the sewered population on the United States side. This figure is expected to rise to 95% by 1978. (See also W76-11249) (Kreager-FIRL)
W76-11650

CONSTRUCTION SAFETY IN WATERWORKS,
Construction Safety Association of Ontario, Toronto, Ontario.
For primary bibliographic entry see Field 5F.
W76-11651

SAFETY IN WATER AND WASTEWATER PLANTS,
Ontario Ministry of the Environment (Toronto).
R. Norton.
In: Annual Conference Proceedings of the Ontario Section of the American Water Works Association, Pollution Control Association of Ontario, and Ontario Municipal Water Association,April 20-23, 1975, Toronto, Ontario, p 326-331.

Descriptors: *Safety, *Treatment facilities, *Water treatment, *Waste water treatment, *Protection, Chemicals, Personnel, Programs, Management, Equipment.

The development of safety programs for water and waste water treatment plants is discussed, with particular emphasis on employer-employee responsibilities. The employer's responsibility centers around gaining the interest and cooperation of employees, with emphasis on preventive safety measures during daily operational activities. Employees in turn can assist management in the development of a preventive safety program and can alert the employer when unsafe conditions exist. Hazardous areas and activities encountered in water and waste water treatment operations include: enclosed spaces such as sewer manholes and watermain valve pits, digester control buildings where methane leaks are possible, chlorination rooms, and activities involving the handling of water treatment chemicals and the dismantling of water treatment equipment. The use of personal protective equipment in hazardous areas is also discussed. (See also W76-11249) (Kreager-FIRL)
W76-11652

OPERATOR TRAINING AND CERTIFICATION IN CANADA,
Environmental Protection Service, Ottawa (Ontario).
A. B. Redekopp.
In: Annual Conference Proceedings of the Ontario Section of the American Water Works Association, Pollution Control Association of Ontario, and Ontario Municipal Water Association, April 20-23, 1975, Toronto, Ontario, p 348-362. 3 tab, 7 ref.

Descriptors: *Training, *Treatment facilities, *Personnel, *Education, *Canada, Water treatment, Waste water treatment, Programs, Organizations, Operations.
Identifiers: Certification.

The status of training and certification programs for waste water and water treatment plant operators in Canada is reviewed. Voluntary certification programs have been established by four provinces to date: British Columbia, Alberta, Saskatchewan, and Manitoba. The Federation of Associations of the Canadian Environment is currently developing nationally acceptable guidelines for operator certification and is considering approaches to assist the provinces in operator training. Current training efforts in Canada cover, for the most part, the general knowledge area of water and waste water treatment operations through seminars or short courses provided by the provincial regulatory agencies and/or local operator associations. The Federal Department of the Environment, however, is currently assisting the three Maritime Provinces in the development of a comprehensive training program for waste water treatment operators which is based on a performance oriented approach to learning. (See also W76-11249) (Kreager-FIRL)
W76-11653

TRAINING AND CERTIFICATION,
Ontario Ministry of the Environment, Toronto. Training, Certification and Safety Section.
R. R. Doddridge.
In: Annual Conference Proceedings of the Ontario Section of the American Water Works Association, Pollution Control Association of Ontario, and Ontario Municipal Water Association, April 20-23, 1975, Toronto, Ontario, p 363-374. 1 fig, 4 tab, 2 ref.

Descriptors: *Training, *Treatment facilities, *Personnel, *Education, *Canada, Water treatment, Waste water treatment, Programs, Organizations, Operations.
Identifiers: Certification, Ontario.

Progress in the training and certification of water and waste water treatment plant operators in Ontario is reviewed. Training programs for water and waste water facility operators have been provided in Ontario for a number of years, with the Ontario Water Resources Commission offering annual courses at the basic, intermediate, and advanced levels. The Ontario Ministry of the Environment has proposed a 4-year program leading to mandatory certification. The development of the program was initiated in 1973 and 1974. The initial program consisted of the following elements: a basic water treatment course, a basic sewage treatment course, a basic gas chlorination workshop, and an activated sludge workshop. In 1974 and 1975 the subject areas were expanded to include a surface water treatment workshop and a maintenance gas fitter certificate course. Further expansion is scheduled for 1975 and 1976 and is expected to include a primary treatment and digestion workshop, a preventive maintenance workshop, a pumping operation workshop and safety and first aid training. (See also W76-11249) (Kreager-FIRL)
W76-11654

NORTHERN ENVIRONMENTAL ENGINEERING - A CANADIAN CHALLENGE,
Stanley Associates Engineering Ltd., Edmonton (Alberta).
For primary bibliographic entry see Field 5D.
W76-11655

THE U. S. ENVIRONMENTAL PROTECTION AGENCY: PAST AND FUTURE CHALLENGES,
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5D.
W76-11658

AGRICULTURAL ENGINEERING WATER RESOURCES INFORMATION RETRIEVAL OF PUBLISHED LITERATURE,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 10D.
W76-11691

ESTIMATING STOCK WATER USE IN RURAL WATER SYSTEMS,
Burns and McDonnell, Kansas City, Mo.
For primary bibliographic entry see Field 3F.
W76-11696

THE ECONOMIC IMPACT OF CONTROLLING NONPOINT POLLUTION IN HARDWOOD FORESTLAND,
Purdue Univ., Lafayette, Ind. Dept. of Agricultural Economics.
W. L. Miller, and H. W. Everett.
American Journal of Agricultural Economics, V 7, No. 4, p. 576-583, 1975. 1 fig., 3 tab., 24 r
OWRT B-042-IND (7) 14-31-0001-3586

Descriptors: *Water quality control, *Econon impact, *Forest management, *Sediment contr Lumbering, *Indiana, Measurement, Incon Costs, Model studies.
Identifiers: *Nonpoint pollution control, Linc Hills(Ind).

Two models were developed based on the Linc Hills area in Indiana to compare alternative m sures of the economic impact of forest mana ment practices, harvesting methods, and rates harvest which could be introduced to reduce sediment loss from forest land. Controlling n point pollution results in substantial economic pact both on the firms directly affected and the gion. As the economic activity is constrained placing limits on soil loss at 106,280 tons per ye the regional economic impact is reduced to million annually. The annual reduction in regio income that occurs as soil loss declines fr 156,280 to 106,280 tons per year results in a 76 c reduction in income to the region for each reduction in soil loss. As the soil loss leve further reduced to 56,280 tons per year, regio income is reduced about $1.4 million more nually or about an additional $28 annually for e ton reduction in soil loss. The opportunity cos income foregone is the appropriate measure of cost to society for introducing various nonp pollution control measures. The cost of control nonpoint pollution is being greatly underes mated; thus it is suggested that the regional imp may be a more appropriate measure than the di impact. (Auen-Wisconsin).
W76-11697

CTORS INFLUENCING NITRATE TRANS-
RMATIONS IN SEDIMENTS,
due Univ., Lafayette, Ind. Agricultural Experi-
nt Station.
primary bibliographic entry see Field 5C.
6-11700

ATUS REPORT ON HEAT STORAGE
LLS,
eral Electric Co., Santa Barbara, Calif. Center
Advanced Studies.
. Meyer.
er Resources Bulletin, Vol. 12, No. 2, p 237-
April, 1976. 5 fig, 1 tab, 11 ref. OWRT C-5205
0)(4).

criptors: *Thermal power, *Thermal water,
rmal conductivity, Heat transfer, Ground-
r, Aquifers, Pipelines, Thermodynamics,
mal radiation, Heat balance, Electric power-
s, Electric power costs, Injection wells,
nematical models, *Underground storage,
mal pollution.
tifiers: *Thermal energy, *Heat storage wells,
e heat, Eulerian models.

gh technical information now exists to sup-
preliminary conclusions that large amounts of
water can be stored in aquifers for several
hs, at low cost and with low heat loss, using
Heat Storage Well concept. Heat Storage
offer the possibility of conserving a substan-
art of the heat energy now wasted in generat-
lectricity while reducing thermal pollution
d by waste heat. Large thermal electric
r plants would produce heat at useful tem-
ures such as 300-400 deg. F. Combined elec-
nd heat-generating systems will require low-
and low-loss storage of large amounts of hot
for periods of 90 to 180 days to serve both
ic loads and seasonally varying heat loads.
ared to conventional electricity only
ns, combined electricity-heat systems can
nore than 20 percent in energy, reduce the
f both electricity and heat, and eliminate the
or water cooling structures. Possibilities for
es in legal and institutional practices are sug-
, such as making resource-allocation deci-
on the basis of energy units rather than dol-
Heiss-NWWA)
1701

TICAL APPLICATIONS OF SPACE
EMS, SUPPORTING PAPER 7, ENVIRON-
AL QUALITY.
al Research Council, Washington, D. C.
on Environmental Quality.
mary bibliographic entry see Field 4A.
1760

LAND FLOW PRETREATMENT OF
EWATER,
Carolina State Univ., Raleigh. Dept. of
cal and Agricultural Engineering.
mary bibliographic entry see Field 5D.
775

VAL OF UNDESIRABLE CATIONS
ACID MINE WATER BY A NEW CA-
XCHANGE MATERIAL,
Virginia Univ., Morgantown. Water
h Inst.
nary bibliographic entry see Field 5D.
776

R POLLUTION CONTROL ACT OF 1972,
MIC IMPACTS, MEAT PRODUCTS,
ment Planning and Research Associates,
nhattan, Kans.
le from the National Technical Informa-
vice, Springfield, Va 22161, as PB-251 215,
paper copy, $3.00 in microfiche. National
sion on Water Quality, Washington, D. C.
Report NCWQ 75/48, November 1975, 617 p. WQ5ACO11.

Descriptors: *Pollution abatement, *Industrial wastes, Industries, Forecasting, *Federal Water Pollution Control Act, *Economic impact, *Industrial plants, *Water pollution control, *Operating costs, *Estimated costs, Foods, *Food processing industry.
Identifiers: *Meat products industry, Federal Water Pollution Control Act Amendments of 1972.

Economic impact on the meat products industry of achieving the 1977 best practicable technology (BPT) and 1983 best achievable technology (BAT) effluent limitation requirements of the Federal Water Pollution Control Act Amendments of 1972 (P.L. 92-500) were assessed. The analysis considers these impacts in four categories of the industry -- processing, rendering, packing and poultry. Estimated price increases as a result of the Act are given along with total investment and anticipated operating costs necessary to meet the Act's requirements. The analysis projects the numbers and kinds of plants most likely to close as a result of the BPT and BAT requirements, and estimates resulting employment losses for each category. (NCWQ)
W76-11779

PUBLIC LAW 92-500: TECHNOLOGY ASSESSMENT, TECHNICAL VOLUME.
National Commission on Water Quality, Washington, D.C. Technology Assessment Sector.
C. W. Carry, J. C. Baummer, Jr., R. G. Kissell, Jr., D. B. Large, and D. M. Wells.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-252 298. $21.25 inpaper copy, $3.00 in microfiche. National Commission on Water Quality, Washington, D.C., Report NCWQ 75/109, April 1976, 795 p.

Descriptors: *Industries, *Technology, *Treatment facilities, *Industrial wastes, Costs, Manpower, Energy, *Water pollution control, Pollution abatement, *Water quality standards, Water law, *Federal Water Pollution Control Act, *Municipal wastes, Methodology.
Identifiers: Federal Water Pollution Control Act of 1972, *Technology assessment.

Technologies capable of achieving compliance with effluent limitations required for dischargers to comply with Public Law 92-500 were investigated. Applicable technologies were determined for publicly owned treatment works, industry and irrigated agriculture point sources. Costs and manpower and energy requirements for each technology were also defined. Technologies capable of reducing pollutants from non-point sources were examined in summary fashion. A technical assessment of Public Law 92-500 is presented along with an explanation of methodology, data sources and Commission staff calculations. Also included are lists of Contractors and Consultants and summaries of about 20 Technology Contractor Reports. (NCWQ)
W76-11780

ENVIRONMENTAL IMPACT ASSESSMENT, WATER QUALITY ANALYSIS, YADKIN - PEE DEE RIVER BASIN,
TRW, Inc. Redondo Beach, California.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-250 933, $8.00 in paper copy, $3.00 in microfiche. National Commission on Water Quality, Washington, D.C., Report NCWQ 75/65, May 1975. 217 p, 7 fig, 34 tab. WQ5ACO38.

Descriptors: River basins, *Federal Water Pollution Control Act, Ecology, Environmental effects, *North Carolina, Environment, *Comprehensive planning, Limnology, Water pollution control, *South Carolina, Forecasting, Water quality, Waste water treatment, Sites, Pollution abatement.
Identifiers: *Environmental impact, Federal Water Pollution Control Act Amendments of 1972, *Yadkin-Pee Dee River basin(NC-SC).

A comprehensive water quality analysis and environmental impact assessment at the Yadkin-Pee Dee River Basin was undertaken as part of a national assessment of anticipated environmental impacts of theoretically achieving or not achieving the requirements and goals of the Federal Water Pollution Control Act Amendments of 1972 (P.L. 92-500). The analysis (1) characterized historical and existing water quality and environmental conditions, (2) projected resultant water quality assuming specific levels of wastewater treatment to point source effluents entering the study site, and (3) anticipated biological, ecological and environmental effects, impacts and benefits to result from projected changes in water quality. This site assessment is one of 41 similar studies conducted for the Environmental Sciences sector of the Commission. National on Water Quality. (NCWQ)
W76-11781

WATER POLLUTION CONTROL ACT OF 1972, ENVIRONMENTAL IMPACT ASSESSMENT, POTOMAC RIVER.
Academy of Natural Sciences, Philadelphia, Pa.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-250 934, $7.75 in paper copy, $3.00 in microfiche. National Commission on Water Quality, Washington, D.C., Report NCWQ 75/68, July 1975. 202 p, 4 fig, 10 tab, 86 ref, 6 append. WQ5ACO44.

Descriptors: Rivers, *River basins, *Potomac River, *Virginia, Ecology, *Federal Water Pollution Control Act, Environment, *Comprehensive planning, Limnology, *Water pollution control, *Maryland, *District of Columbia, *Pollution abatement, *Forecasting, Environmental effects, *Water quality, Waste water treatment, Sites.
Identifiers: *Environmental impact, Federal Water Pollution Control Act Amendments of 1972, *Potomac River estuary(DC-Va-Md).

A comprehensive environmental impact assessment at the Potomac River was undertaken as part of a national assessment of anticipated environmental impacts of theoretically achieving or not achieving the requirements and goals of the Federal Water Pollution Control Act Amendments of 1972 (P.L. 92-500). The analysis (1) characterized historical and existing environmental conditions and (2) projected anticipated biological, ecological and environmental change, impacts and benefits, assuming specific reductions in point source effluent loadings and resultant water quality within the site. This site assessment was one of 41 similar studies conducted for the Environmental Sciences sector of the National Commission on Water Quality. (NCWQ)
W76-11782

WATER QUALITY ANALYSIS, SNAKE RIVER, IDAHO.
Tetra Tech, Inc., Lafayette, Calif.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-250 929, $5.50 in paper copy, $3.00 in microfiche. National Commission on Water Quality, Washington, D.C., Report NCWQ 75/60, February 1976. 105 p, 30 fig, 20 tab, 16 ref. WQ5ACO27.

Descriptors: Sites, *Idaho, *Federal Water Pollution Control Act, Rivers, *Comprehensive planning, *River basins, Ecology, Environmental effects, Environment, Water pollution, *Pollution abatement, *Water quality, *Forecasting, Waste water treatment.
Identifiers: Federal Water Pollution Control Act Amendments of 1972, *Snake River(Idaho).

A comprehensive water quality analysis at the Snake River, Idaho, was undertaken as part of a national assessment of anticipated environmental

impacts of theoretically achieving or not achieving the requirements and goals of the Federal Water Pollution Control Act Amendments of 1972 (P.L. 92-500). The analysis (1) characterized historical and existing water quality conditions and (2) projected resultant water quality within the site, assuming specific levels of wastewater treatment to point source effluents entering the study site. This assessment is one of 41 similar studies conducted for the Environmental Sciences sector of the National Commission on Water Quality. (NCWQ)
W76-11783

WATER POLLUTION CONTROL ACT OF 1972, ENVIRONMENTAL IMPACT ASSESSMENT, SNAKE RIVER.
Parametrix, Inc., Seattle, Wash.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-251 226, $7.50 in paper copy, $3.00 in microfiche. National Commission on Water Quality, Washington, D.C., Report NCWQ 75/69, January 1976. 170 p, 8 fig, 34 tab, 62 ref, 2 append. WQ5ACO36.

Descriptors: Rivers, River basins, *Federal Water Pollution Control Act, Ecology, *Comprehensive planning, *Idaho, Environment, Limnology, *Environmental effects, *Water pollution control, *Pollution abatement, *Forecasting, *Water quality, Waste water treatment, Sites.
Identifiers: Environmental impact, Federal Water Pollution Control Act Amendments of 1972, *Snake River(Idaho).

A comprehensive environmental impact assessment at the Snake River was undertaken as part of a national assessment of anticipated environmental impacts of theoretically achieving or not achieving the requirements and goals of the Federal Water Pollution Control Act Amendments of 1972 (P.L. 92-500). The analysis (1) characterized historical and existing environmental conditions and (2) projected anticipated biological, ecological and environmental change, impacts and benefits, assuming specific reductions in point source effluent loadings and resultant water quality within the site. This site assessment was one of 41 similar studies conducted for the Environmental Sciences sector of the National Commission on Water Quality. (NCWQ)
W76-11784

WATER QUALITY ANALYSIS, UPPER RIO GRANDE.
Water Resources Engineers, Inc., Austin, Tex.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-250 981, $4.50 in paper copy, $3.00 in microfiche. National Commission on Water Quality, Washington, D.C., Report NCWQ 75/55, March 1975. 60 p, 2 fig, 22 tab, 7 ref. WQ5ACO29.

Descriptors: Sites, *Comprehensive planning, Rivers, *Texas, *New Mexico, Colorado, *River basins, Ecology, *Rio Grande River, Environment, Environmental effects, Water pollution, *Pollution abatement, *Water quality, *Federal Water Pollution Control Act, *Forecasting, Waste water treatment.
Identifiers: Federal Water Pollution Control Act Amendments of 1972, *Upper Rio Grande River(Tex-N Mex).

A comprehensive water quality analysis at the Upper Rio Grande was undertaken as part of a national assessment of anticipated environmental impacts of theoretically achieving or not achieving the requirements and goals of the Federal Water Pollution Control Act Amendments of 1972 (P.L. 92-500). The analysis (1) characterized historical and existing water quality conditions and (2) projected resultant water quality within the site, assuming specific levels of wastewater treatment to point source effluents entering the study site. This assessment is one of 41 similar studies conducted for the Environmental Sciences sector of the National Commission on Water Quality. (NCWQ)
W76-11785

WATER POLLUTION CONTROL ACT OF 1972, ENVIRONMENTAL IMPACT ASSESSMENT, IOWA-CEDAR RIVER BASIN.
Midwest Research Inst., Minneapolis, Minn. North Star Research Div.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-251 227, $12.00 in paper copy, $3.00 in microfiche. National Commission on Water Quality, Washington, D.C., Report NCWQ 75/70, March 1976. 430 p, 43 fig, 30 tab, 73 ref, 8 append. WQ5AC039.

Descriptors: Rivers, *River basins, *Federal Water Pollution Control Act, Ecology, *Environmental effects, Iowa, Environment, *Comprehensive planning, Limnology, *Water pollution control, *Pollution abatement, *Forecasting, *Water quality, Waste water treatment, Sites.
Identifiers: Federal Water Pollution Control Act Amendments of 1972, *Iowa-Cedar Rivers(Iowa).

A comprehensive environmental impact assessment at the Iowa-Cedar Rivers was undertaken as part of a national assessment of anticipated environmental impacts of theoretically achieving or not achieving the requirements and goals of the Federal Water Pollution Control Act Amendments of 1972 (P.L. 92-500). The analysis (1) characterized historical and existing environmental conditions and (2) projected anticipated biological, ecological and environmental change, impacts and benefits, assuming specific reductions in point source effluent loadings and resultant water quality within the site. This site assessment was one of 41 similar studies conducted for the Environmental Sciences sector of the National Commission on Water Quality. (NCWQ)
W76-11786

ENVIRONMENTAL IMPACT ASSESSMENT, WATER QUALITY ANALYSIS, J. PERCY PRIEST RESERVOIR.
Vanderbilt Univ., Nashville, Tenn. Dept. of Environmental and Water Resources Engineering.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-251 098, $9.25 in paper copy, $3.00 in microfiche. National Commission on Water Quality, Washington, D.C., Report NCWQ 75/52, August 1975. 270 p, 61 fig, 66 tab, 32 ref, 7 append. WQ5AC065.

Descriptors: *Reservoirs, *Federal Water Pollution Control Act, Ecology, *Environmental effects, *Tennessee, Environment, *Comprehensive planning, Limnology, Water pollution control, *Forecasting, *Water quality, Waste water treatment, Sites, *Pollution abatement.
Identifiers: Environmental impacts, Federal Water Pollution Control Act Amendments of 1972, J. Percy Priest Reservoir(Tenn).

A comprehensive water quality analysis and environmental impact assessment at the J. Percy Priest Reservoir was undertaken as part of a national assessment of anticipated environmental impacts of theoretically achieving or not achieving the requirements of the Federal Water Pollution Control Act Amendments of 1972 (P.L. 92-500). The analysis (1) characterized historical and existing water quality and environmental conditions, (2) projected resultant water quality, assuming specific levels of wastewater treatment to point source effluents entering the study site, and (3) anticipated biological, ecological and environmental effects, impacts and benefits to result from projected changes in water quality. This site assessment is one of 41 similar studies conducted for the Environmental Sciences sector of the Commission. (NCWQ)
W76-11787

ENVIRONMENTAL IMPACT ASSESSMENT WATER QUALITY ANALYSIS, UTAH LAKE JORDAN RIVER BASIN.
Environmental Dynamics, Inc., Los Angeles Calif.
Available from the National Technical Informa tion Service, Springfield, Va 22161 as PB-25 932, $9.25 in paper copy, $3.00 in microfiche Na tional Commission on Water Quality Washington D.C., Report NCWQ 75/63, December 1975. 357 p 55 fig, 87 tab, 2 append. WQ5AC071.

Descriptors: *River basins, *Federal Water Pollu tion Control Act, Ecology, *Utah *Comprehensive planning, Environmen *Environmental effects, *Lakes, Limnolog *Water pollution control, *Forecasting, *Wate quality, Waste water treatment, Sites, Pollutio abatement.
Identifiers: *Utah Lake-Jordan Rive Basin(Utah), Environmental impact, Feder Water Pollution Control Act Amendments of 197

A comprehensive water quality analysis and e vironmental impact assessment at Utah Lake - Jo dan River Basin was undertaken as part of a n tional assessment of anticipated environmental i pacts of theoretically achieving or not achievi the requirements of the Federal Water Pollutio Control Act Amendments of 1972 (P.L. 92-50 The analysis (1) characterized historical and exi ing water quality and environmental condition (2) projected resultant water quality, assumi specific levels of wastewater treatment to po source effluents entering the study site, and (3) a ticipated biological, ecological and environmen effects, impacts and benefits to result from p jected changes in water quality. This site asse ment is one of 41 similar studies conducted for t Environmental Sciences sector of the Natio Commission on Water Quality. (NCWQ)
W76-11788

WATER POLLUTION CONTROL ACT OF 19 REGIONAL IMPACTS, YELLOWSTO RIVER BASIN.
Stevens, Thompson and Runyan, Inc. Seatt Wash.
Available from the National Technical Inform tion Service, Springfield, Va. 22161, as PB-2 072, $7.25 in paper copy, $3.00 in microfiche. N tional Commission on Water Quality, Washingt D.C., Report NCWQ 75/50, March 1976. 205 p, fig, 62 tab, 224 ref. WQ5AC051.

Descriptors: *River basins, *Regional analy Wyoming, Montana, Regions, *Federal Water P lution Control Act, Water pollution cont Capital costs, Pollution abatement, Water qual Treatment facilities, Water law, Evaluati *Estimated costs, Forecasting, Estimating, Inc tries, Social change, *Social impact, Water util tion.
Identifiers: *Yellowstone River Basin(W Mont), Federal Water Pollution Control Amendments of 1972.

The environmental, economic, social and ins tional impacts of the Federal Water Pollution C trol Act Amendments (PL 92-500) in the lowstone region will generally be small and occur near the various dischargers. The 1983 available treatment (BAT) and 1985 eliminatio discharge (EOD) goals of the Act will not pro a measurable change in the long-term water qu and biological conditions resulting from the best practicable technology (BPT) requiremen the Act. Total capital costs (in 1973 dollars) w an estimated $114 million for BPT with an tional $140 million for BAT. Industries most h ly impacted will be uranium mining, coal m and sugar beet processing. Communities 2,500 people or less, which are required to struct new or upgraded treatment facilities, experience severe social impacts. Regarding use, strict implementation of the law has a p tial to create several economic, legal and

ality problems with apparently insignificant
ter quality benefits to offset these problems.
CWQ)
76-11789

VIRONMENTAL IMPACT ASSESSMENT,
ATER QUALITY ANALYSIS, LOWER MIS-
URI RIVER BASIN.
dwest Research Inst., Kansas City, Mo.
ailable from the National Technical Informa-
n Service, Springfield, Va. 22161, as PB-250
, $7.75 in paper copy, $3.00 in microfiche. Na-
al Commission on Water Quality, Washington,
., Report NCWQ 75/61, December 1975. 207 p,
g, 37 tab, 47 ref, append. WQ5AC024.

criptors: Rivers, *Missouri River, Environ-
ntal effects, Ecology, *Federal Water Pollution
trol Act, Environment, Limnology, *Missouri,
nsas, *Water pollution control, *Forecasting,
ater quality, Waste water treatment, Sites, Pol-
n abatement.
ntifiers: Environmental impact, Federal Water
ution Control Act Amendments of 1972,
wer Missouri River basin(Mo-Kan).

omprehensive water quality analysis and en-
nmental impact assessment at the Lower Mis-
i River was undertaken as part of a national
ssment of anticipated environmental impacts
heoretically achieving or not achieving the
irements of the Federal Water Pollution Con-
Act Amendments of 1972 (P.L. 92-500). The
ysis (1) characterized historical and existing
r quality and environmental conditions, (2)
ected resultant water quality, assuming
ific levels of wastewater treatment to point
ce effluents entering the study site, and (3) an-
ated biological, ecological and environmental
ts, impacts and benefits to result from pro-
d changes in water quality. This site assess-
is one of 41 similar studies conducted for the
ronmental Sciences sector of the National
mission on Water Quality. (NCWQ)
11790

ER POLLUTION CONTROL ACT OF 1972,
RONMENTAL IMPACT ASSESSMENT,
R MISSISSIPPI RIVER BASIN,
est Research Inst., Minneapolis, Minn.
Star Research Div.
able from the National Technical Informa-
ervice, Springfield, Va 22161, as PB-251 222,
in paper copy, $3.00 in microfiche. National
ission on Water Quality, Washington, D.C.,
t NCWQ 75/74, March 1976. 322 p, 42 fig, 38
ref, 7 append. WQ5AC039.

iptors: Sites, *Federal Water Pollution Con-
ct, Rivers, *River basins, *Mississippi River
Ecology, Environment, *Comprehensive
ng, Limnology, *Water pollution control,
esota, *Wisconsin, *Pollution abatement,
casting, Environmental effects, *Water
, Waste water treatment.
iers: Environmental impact, Federal Water
on Control Act Amendments of 1972,
r Mississippi River Basin(Minn-Wisc).

prehensive environmental impact assess-
t the Mississippi-Minnesota-St. Croix con-
e was undertaken as part of a national as-
nt of anticipated environmental impacts of
ically achieving or not achieving the
ments and goals of the Federal Water Pol-
Control Act Amendments of 1972 (P.L. 92-
he analysis (1) characterized historical and
g environmental conditions and (2) pro-
biological, ecological and environmental
, impacts and benefits, assuming specific
ons in point source effluent loadings and
t water quality within the site. This site as-
nt is one of 41 similar studies conducted for
ironmental Sciences sector of the National
ssion on Water Quality. (NCWQ)
791

WATER POLLUTION CONTROL ACT OF 1972, ECONOMIC IMPACTS, DAIRY PRODUCTS.
Development Planning and Research Associates, Inc., Manhattan, Kans.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-251 217, $8.00 in paper copy, $3.00 in microfiche. National Commission on Water Quality, Washington, D.C., Report NCWQ 75/46, November 1975, 215 p. WQ5ACO11.

Descriptors: *Pollution abatement, *Economic impact, *Cost analysis, *Federal Water Pollution Control Act, Industries, Treatment facilities, Forecasting, *Estimated costs, Income, Prices, Engineering costs, *Industrial plants, *Water pollution control, *Dairy industry, *Food processing industry.
Identifiers: Federal Water Pollution Control Act Amendments of 1972.

The economic impacts on the dairy industry of meeting the requirements of the Federal Water Pollution Control Act Amendments of 1972 are examined. The impostion of the 1977 best practicable technology (BPT) and 1983 best available technology (BAT) controls will reduce the net income of larger plants by 30% and a reduction of 50% will be experienced by medium size plants. Of the 4,590 existing establishments, an estimated 164 plants will close as a result of 1977 controls, and the combined costs of BPT and BAT will result in approximately 96 fewer plants in 1983 than in baseline. Most heavily impacted will be single plant firms. Price increases will be about 1% over baseline for BPT with an increase of 0.4% over baseline for BAT. Those dairy product plants which do not discharge into municipal systems can meet BPT by biological treatment systems. Housekeeping improvements coupled with a reduction in water use are recommended to ease the wasteload. BAT requirements can be met by adding tertiary filtration or land disposal to the BPT controls. (NCWQ)
W76-11801

WATER POLLUTION CONTROL ACT OF 1972, ECONOMIC IMPACTS, FOREIGN TRADE,
Public Research Inst., Arlington, Va.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-249 949, $10.50 in paper copy, $3.00 in microfiche. National Commission on Water Quality, Washington, D.C., Report NCWQ 75/34, February 1976. 355 p, 6 fig, 65 tab. WQ5AC009.

Descriptors: Pollution abatement, *Industries, *Economic impact, Iron, Steel, Aluminum, Copper, *Federal Water Pollution Control Act, Forecasting, *Econometrics, Estimating, *Import, *Foreign trade, Water pollution control, *Pulp and paper industry, *Food processing industry, *Mineral industry, Textiles.
Identifiers: Federal Water Pollution Control Act Amendments of 1972.

An analysis is presented of the impacts of the Federal Water Pollution Control Act Amendments of 1972 on seven industries -- iron and steel, aluminum, copper, textiles, pulp and paper, leather tanning and red meat. Econometric models with foreign trade sectors were developed and estimated for each of the industries. Import penetration in the iron and steel industry will increase by an estimated 6% by 1985. Pulp production is estimated to decrease by as much as 1.5%, newsprint by as much as 3% and paperboard by as much as 6%. In most industries with high pollution abatement costs, the volume of trade is small compared to domestic production. Even major percentage changes in the volume of trade do not significantly affect the domestic industry. (NCWQ)
W76-11802

WATER POLLUTION CONTROL ACT OF 1972, ECONOMIC IMPACTS, FRUITS AND VEGETABLES.
Development Planning and Research Associates, Inc., Manhattan, Kans.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-251 216, $10.75 in paper copy, $3.00 in microfiche. National Commission on Water Quality, Washington, D.C., Report NCWQ 75/45, November 1975, 357 p. WQ5AC011.

Descriptors: *Water pollution control, *Economic impact, *Cost analysis, *Federal Water Pollution Control Act, Forecasting, *Treatment facilities, *Capital costs, Engineering costs, Prices, *Estimated costs, *Pollution abatement, *Industrial plants, *Canneries, *Food processing industry.
Identifiers: Federal Water Pollution Control Act Amendments of 1972.

The economic impacts on the fruits and vegetables processing industry of achieving the 1977 best practicable technology (BPT) and 1983 best available technology (BAT) requirements of the Federal Water Pollution Control Act Amendments of 1972 are assessed. The greatest price increases will be required by small and medium size plants in the corn, tomato and sauerkraut sectors. Increased prices will be an estimated 0.26% over baseline for BPT and will increase by an estimated .47% with the addition of pretreatment costs. Under BAT control standards, this figure becomes 0.62% by 1983. Total capital costs (in 1973 dollars) for BPT will be an estimated $128 million and $201.9 million for BPT and BAT respectively. Plant closures due to BPT are projected at 107 and an estimated 128 plants will close as a result of the combined costs of BPT and BAT. Most severely impacted will be the citrus plants in Florida, and potato dehydrating plants in Idaho, Oregon and Washington. (NCWQ)
W76-11803

WATER POLLUTION CONTROL ACT OF 1972, TECHNOLOGIES AND ECONOMIC IMPACTS, THE FEEDLOT INDUSTRY,
Development Planning and Research Associates, Inc., Manhattan, Kans.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-251 214, $10.75 in paper copy, $3.00 in microfiche. National Commission on Water Quality, Washington, D.C., Report NCWQ 75/47, November 1975. 409 p, 2 fig, 82 tab, 6 append. WQ5AC011.

Descriptors: *Pollution abatement, *Economic impact, *Feed lots, *Cost analysis, *Federal Water Pollution Control Act, Forecasting, Farm wastes, Technology, *Estimated costs, Engineering costs, Dairy industry, Hogs, *Water pollution control, Poultry.
Identifiers: *Feed lot industry, Beef, Federal Water Pollution Control Act Amendments of 1972.

The necessary technologies and associated economic impacts on the feedlot industry to meet the requirements of the Federal Water Pollution Control Act Amendments of 1972 are examined. Seventeen technologies and related costs for the beef, turkey, dairy and hog categories of the industry are assessed. If the law applies only to those feedlots which discharge directly into streams, compliance will require a total investment of between $346-446 million for best practicable tecnology (BPT), with an additional $107-118 million for BAT best available technology. Annual costs will be an estimated $66-82 million and $15 million for BPT and BAT respectively. Estimated total costs will triple if the law applies to all feedlots. The hog sector will require the most expenditures for effluent control, while the heaviest price and quantity impacts, though generally less than 1%, will fall in the dairy and turkey categories. Small feedlots will be the most heavily impacted and (among direct dischargers) an estimated 37,000 to 77,000 feedlot plants will close by

1977, with an additional 2,800-5,000 closing by 1983. About 80% of the closures will occur in the dairy and hog categories. (NCWQ)
W76-11804

WATER POLLUTION CONTROL ACT OF 1972, DEMOGRAPHIC AND QUANTITATIVE ANALYSIS,
Human Resources Planning Inst., Seattle, Wash.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-251 321, $5.50 in paper copy, $3.00 in microfiche. National Commission on Water Quality, Washington, D.C., Report NCWQ 75/44, December 1975. 112 p, 11 fig, 22 tab, 29 ref. WQ5AC086.

Descriptors: *Pollution abatement, *Social impact, Human population, Forecasting, *Federal Water Pollution Control Act, Water pollution control, Industrial plants, *Employment, Northeast U.S., Central U.S., *Unemployment, *Employment opportunities, Recreation, *Social change.
Identifiers: Federal Water Pollution Control Act Amendments of 1972.

An assessment is presented of the social impacts resulting from the primary and secondary impacts (as measured by changes in employment) of the Federal Water Pollution Control Act of 1972. Job creation, as a result of the Act, will accrue primarily to younger, white males in the middle income category. Females, older workers, and low income workers will be among those to experience the heaviest job losses. Plant closures (which will most heavily affect low income groups) will be concentrated in the Northeast and Northcentral regions of the U.S. If the existing lack of participation in water based recreation is a function of polluted water bodies, then recreation benefits will accrue most heavily to low income, non-white urban males. If, however, this low participation is a reflection of consumer preference rather than lack of clean water, greatest benefits will be concentrated among upper income, non-urban white males. (NCWQ)
W76-11805

PUBLIC LAW 92-500-- WATER QUALITY ANALYSIS AND ENVIRONMENTAL IMPACT ASSESSMENT, TECHNICAL REPORT (VOLUME I),
National Commission on Water Quality, Washington, D. C. Environmental Sciences Sector.
H. L. Allen, L. E. Johnson, R. E. Keen, E. R. Meyer, and J. L. Peterson.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-252 167-01-02 SET, $28.25 in paper copy, $3.00 in microfiche. Report NCWQ-75-100-1, April, 1976. 527 p.

Descriptors: Regions, *Federal Water Pollution Control Act, Sites, *Methodology, Water quality standards, Ecology, Projections, Benefits, Environmental effects, Limnology, *Water pollution control, *Regional analysis, *Pollution abatement, *Forecasting, *Water quality, Waste water treatment.
Identifiers: *Environmental impact, Federal Water Pollution Control Act Amendments of 1972.

The Environmental Sciences sector of the National Commission on Water Quality was charged with conducting a national water quality and environmental impact assessment as part of a larger analysis of the effects of achieving or not achieving the requirements and goals of the Federal Water Pollution Control Act Amendments of 1972 (P. L. 92-500). The overall study methodology, including inherent assumptions and limitations, is outlined. A major part of the national assessment focused on 41 site-specific studies in which historical and existing water quality and environmental conditions are assessed, followed by projections of change, impacts and benefits to result from abatement of point source effluent loadings. Results and findings from these studies are collated, reviewed and summarized, both regionally and nationally, and are presented in this volume. Volume II contains other special water quality and environmental assessment topics. (See also W76-11807) (NCWQ)
W76-11806

PUBLIC LAW 92-500--WATER QUALITY ANALYSIS AND ENVIRONMENTAL IMPACT ASSESSMENT, TECHNICAL REPORT, VOLUME II,
National Commission on Water Quality, Washington, D. C. Environmental Sciences Sector.
J. L. Allen, L. E. Johnson, R. E. Keen, E. R. Meyer, and J. L. Peterson.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-252 167-01-02 SET, $28.25 in paper copy, $3.00 in microfiche. Report NCWQ 75/100-2, April 1976, 570 p.

Descriptors: Regions, *Federal Water Pollution Control Act, Sites, *Methodology, Water quality standards, Ecology, Projections, Benefits, Environmental effects, Limnology, *Water pollution control, *Pollution abatement, *Regional analysis, *Forecasting, *Water quality, Waste water treatment.
Identifiers: *Environmental impact, Federal Water Pollution Control Act Amendments of 1972.

Special environmental assessment topics are presented, including (1) analysis of environmental effects of disposal of municipal and industrial wastewater-treatment residuals; (2) environmental effects of the disposal of municipal effluents into near shore marine waters; (3) effects of pollutants on bird species,; (4) evaluation of water quality models for site-specific and regional areas; (5) an overview of national waste loads and urban-suburban stream quality response; (6) a summary of national residuals production; (7) patterns in nine selected standing water bodies; (8) a summary of biological data used in site-specific studies; (9) the state of the art of projecting ecological and environmental change; (10) a review of existing water quality and environmental data systems, and (11) recommendations for advancing the state of the art of projecting water quality and environmental change. Appendix information includes work statements used in the studies, a listing of criteria applicable to possible expemptions under section 316 (thermal) of the Act and a list of staff, consultants etc. contributing to this report. (See also W76-11806) (NCWQ)
W76-11807

SHIP BALLAST, OIL AND WATER SEPARATION SYSTEM,
J. Di Perna.
U.S. Patent No. 3,957,009, 3 p, 5 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 946, No 3, p 1031, May 18, 1976.

Descriptors: *Patents, *Oil pollution, *Oily water, *Water pollution control, *Water pollution treatment, Water quality control, *Separation techniques, Floating.
Identifiers: Ballast water.

The oil and ship ballast water separation system includes a main pipe extending longitudinally through the amid-ship tanks and which is connected by cross-tees to a series of branch pipes extending sideways and leading into the wing tanks. Each one of the tanks are connected to an upward extending flexible accordion pipe or duct which at its upper end is connected to a floating oil collection unit which includes a buoyant collar around a downward converging funnel that is open on top. The buoyancy of the collar is such that the floation of the unit is with the upper edge of the funnel being at water level surface, so that only oil above the water level flows down into the funnel. The main pipe extends at one end into the collection tank where it is fitted with an upward turned elbow so that the oil from all the tanks is thus collected in the collection tank. In operative use, it is now evident that prior to returning ballast water back into the sea, the residue oil is thus removed from the tanks on a day when the ship is not excessively rolling or pitching so that the oil is steady on top. After the oil is removed, the ballast water is returned to the sea prior to entry into port without contaminating the sea. (Sinha - OEIS)
W76-11827

DEVICE FOR SEPARATING LIQUIDS OF SPECIFICALLY LOWER DENSITY THAN WATER, AND PARTICULARLY OIL, FROM WATER,
Fabrique Euro Pollution Control Systems, Inc (Luxemburg). (Assignee).
P. Jakubek, and K. Biswanger.
U.S. Patent No. 3,957,641, 4 p, 3 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 946, No 3, p 1231, May 18, 1976.

Descriptors: *Patents, *Oil pollution, *Oily water, Water pollution sources, *Water quality control, *Water pollution treatment, *Separation techniques, Density stratification, Pumps, Equipment.
Identifiers: Bilge water.

A device for separating liquids of lower density than water, in particular oil, from water, comprises a pump and a separator receiving the liquid from the pump. The separator has a settling chamber and a filter pack arranged behind the latter. A line between the pump and the settling chamber feeds the liquids to the settling chamber and includes a vent valve. An overflow opening device is provided between the settling chamber and the filter pack. A shutoff member is provided for closing the overflow opening in response to the thickness of the layer of liquid of lower density collected in the settling chamber. The device is intended to make an effective pumping out of bilge possible and to reliably prevent water which has been contaminated with oil or the like from being pumped overboard. Also the device should be capable of automatic operation without requiring complicated electric controls. (Sinha - OEIS)
W76-11836

INSTALLATION FOR REMOVING POLLUTANTS FROM WATERWAYS,
F. M. Wickert.
U.S. Patent No. 3,957,646, 9 p, 13 fig, 13 ref; Official Gazette of the United States Patent Office, Vol 946, No 3, p 1233, May 18, 1976.

Descriptors: *Patents, *Water pollution control, Water pollution sources, *Oil pollution, Oil spills, *Oily water, Water pollution treatment, Water quality control, *Separation techniques, Skimming, River flow, Streamflow, Equipment.

A floating installation for the recovery of a liquid pollutant such as petroleum or the like, from navigable waterways, includes a main vessel adapted for floating movement in the water, a receiving tank connected to the main vessel, and a hinged scoop for skimming the liquid pollutant from the water surface as the vessel moves. The scoop is equipped with buoys for controlling the level of the inlet end with respect to the water surface. The opposite or discharge end of the scoop is connected to the receiving tank. The receiving tank is mounted for movement relative to the main vessel, such that it can float in the water independently of the main vessel. A primary separating means including settling tanks are supported on the main vessel to receive the collected pollutant and for separation of the water collected with the pollutants. A secondary separating means is connected to the settling tanks for selectively separating the remaining water from the pollutant and for the primary separation and for discharging

ater from the vessel while transferring the covered pollutant to storage tanks for subquent further refinement and use.
76-11837

EMOVING OIL FROM WASTE WATER WITH LFUR,
noco Production Co., Tulsa, Okla. (Assignee).
W. Jones.
S. Patent No. 3,957,647, 6 p, 6 fig, 7 ref; Official zette of the United States Patent Office, Vol , No 3, p 1233, May 18, 1976.

scriptors: *Patents, *Water pollution control, ter pollution treatment, Water quality control, l pollution, *Oily water, *Coalescence, Coagu- on, *Separation techniques, *Sulfur, Filtration.

ethod of removing dispersed oil from water is contacting the oily water with sulfur to cause oil to coalesce or agglomerate. In a preferred odiment, the water containing the dispersed s flowed through a bed of granular media of ular sulfur or sulfur coated sand, which ents a surface area of solid phase sulfur to esce the dispersed oil. The coalesced oil is separated from the water. In another embodi- t, a sulfur slurry is mixed with the oily water ause the oil to coagulate with the sulfur. A rator, such as a cyclone separator, separates oagulate from the water. (Sinha - OEIS)
-11838

THOD OF INHIBITING SCALE FOR HIGH PERATURE STEAM WELLS,
n Oil Co. of California, Brea. (Assignee).
rimary bibliographic entry see Field 8G.
-11842

EGRADATION OF OIL ON WATER SURES,
e of the Secretary (Navy), Washington, D. C.
gnee).
rtha, and R. M. Atlas.
Patent No. 3,959,127, 3 p, 1 fig, 6 ref; Official te of the United States Patent Office, Vol o 4, p 1737, May 25, 1976.

iptors: *Biodegradation, *Patents, *Oil *Oil pollution, Water pollution sources, r pollution treatment, *Water pollution con- Water quality control, *Microbial degrada- Aquatic microbiology, Nutrients, Nitrogen unds, Phosphorus compounds, Microorgan-

ng oil left to its natural fate is eventually ned by microorganisms that use it as a of carbon and energy. This natural radation is a slow process, and is con- tly unable to prevent the oil from causing ive damage before its ultimate elimination. vention describes a way to speed up this biodegradation process to a level that al- ts use as an oil cleanup process and ue. This greatly enhanced rate of oil ation is accomplished by applying the es- microbial nutrients to the oil slicks in a at dissolves in or adheres to the oil and thus ely stimulates the activity of oil-metabolizroorganisms. For maximum proliferation etabolic activity, hydrocarbon degrading ganisms require additional nutrients such es and phosphates. These are absent from are typically present in natural waters in amounts only. The nitrogen and rous sources are a paraffinized urea slowgarden fertilizer with a nitrogen content of ially 25% and pyrophosphoric acid dioctyl a substantially 9 to 1 ratio of fertilizer to inha-OEIS)
44

OIL COLLECTION AGENTS AND THEIR USE IN CONTAINING OIL SLICKS,
Exxon Research and Engineering Co., Linden, N. J. (Assignee).
G. P. Canevari.
U.S. Patent No. 3,959,134, 6 p, 1 tab, 5 ref; Official Gazette of the United States Patent Office, Vol 946, No 4, p 1739, May 25, 1976.

Descriptors: *Patents, *Oil spills, *Oil pollution, Water pollution sources, *Water pollution treatment, *Water pollution control, Water quality control, Surfactants, Surface tension.
Identifiers: Oil slicks.

It has been found that oil slicks can be contracted and contained by contacting the perimeter of the oil slicks or the water surrounding the oil slicks with an oil collection agent comprised of a mixture of C10-C20 aliphatic monocarboxylic acid or sorbitan monoester in combination with a nonpolar solvent or a solvent package that is essentially nonpolar. The effective spreading caused by the spreading pressure of the oil collection agent thereby reduces the area of the oil slick in size and the oil may thereafter be destroyed or physically removed from the water. The oil collection agents encompassed by this invention have the additional advantages of having low toxicities as well as pour points low enough to enable their use during operations where water and/or air temperatures are less than 45 Deg F. (Sinha-OEIS)
W76-11845

OIL SPILL CLEANUP METHOD AND APPARATUS,
Shell Oil Co., Houston, Tex. (Assignee).
R. R. Ayers, and D. P. Hemphill.
U.S. Patent No. 3,959,136, 4 p, 5 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 946, No 4, p 1740, May 25, 1976.

Descriptors: *Patents, *Oil spills, *Oil pollution, Water pollution sources, *Water pollution treatment, *Water pollution control, Water quality control, *Skimming, Equipment, *Separation techniques.

A method and apparatus is provided whereby an oil spill, in particular a small volume spill, can be skimmed from the water in an efficient and economical manner. The apparatus is a skimmer positioned between the sides of a catamaran and held by hinges so as to be pivotable. The skimmer has baffled entry ports which are arranged on a plane adjustably inclined or about the periphery of a drum so that oil enters to a chamber which is beneath an inverted funnel suspended over the interior of the skimmer or which is the axle of the drum. The skimmer is inclined so that the baffled entry port is at an angle relative to the current. Oil is collected within the skimmer and the position of the skimmer is changed to horizontal. The oil is then withdrawn from the top of the skimmer through the inverted funnel. (Sinha-OEIS)
W76-11846

HYDROMETEOROLOGY OF HEAVY RAINSTORMS IN CHICAGO AND NORTHEASTERN ILLINOIS, PHASE I - HISTORICAL STUDIES,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 2B.
W76-11875

THE FUTURE OF THE SAVANNAH RIVER, PROCEEDINGS OF A SYMPOSIUM.
Clemson Univ., S.C. Water Resources Research Inst.
For primary bibliographic entry see Field 4A.
W76-11877

RELATING ENVIRONMENTAL MODELING TO POLICY ISSUES AND DECISIONS,
Environmental Protection Agency, Washington, D. C.
E. H. Pechan, III, R. A. Luken, and H. M. Maynard.
Ecological Modelling (International Journal on Ecological Modelling and Engineering and Systems Ecology), Vol. 1, No. 1, p 49-65, May 1975. 7 tab, 21 ref.

Descriptors: *Pollution abatement, *Linear programming, *Computer models, *Ecology, Costs, Water, Air, Solid wastes, Thermal pollution, Decision making, Optimization, Computer programs, Equations, Mathematical models, Systems analysis.
Identifiers: Noise, Budgets.

Described is a linear program-based computer model which has been developed to identify the most effective spending patterns for environmental cleanup based on public preferences and spending limitations. The inputs to the model include the costs of removing each residual studied from its various sources. The objective function is the total 'value of removal.' The factor added for each residual consists of a value for the residual multiplied by the quantity or fraction removed. Results of the analysis relate to and support current and projected policy decisions by the U. S. Environmental Protection Agency (EPA) for air and water programs. In addition, the results of the analysis suggest that EPA undertake a redirection of the Nation's resources among residual control programs. (Bell-Cornell)
W76-11879

MATHEMATICAL MODELLING AND ENVIRONMENTAL DECISION-MAKING,
Department of Environment, Ottawa, Ont. Canada, Environmental Systems Branch.
For primary bibliographic entry see Field 6G.
W76-11880

MODELS IN WATER QUALITY PLANNING,
Karlsruhe Univ. (West Germany). Institut fuer Siedlungswasserwirtschaft.
For primary bibliographic entry see Field 5B.
W76-11882

ECOSYSTEM MODELING OF WATER-HYACINTH MANAGEMENT IN LAKE ALICE, FLORIDA,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
W. J. Mitsch.
Ecological Modelling (International Journal on Ecological Modelling and Engineering and Systems Ecology), Vol. 2, No. 1, p 69-89, March 1976. 13 fig, 2 tab, 35 ref.

Descriptors: *Ecosystems, *Water hyacinth, Management, *Lakes, *Simulation analysis, *Water quality control, Eutrophication, Mathematical models, Diversion, Water quality, Dissolved oxygen, Equations, Computers, Nitrogen, Systems analysis, *Florida.
Identifiers: *Lake Alice(Florida), Bottom detritus decomposer module, Prediction.

A mathematical model was developed for Lake Alice, a small, eutrophic, Karst-topography lake in Gainesville, Florida. The management of the floating aquatic plant, the waterhyacinth (Eichhornia crassipes) was considered one of the main objectives of the model. Simulated diversion of the treated sewage inflow reduced waterhyacinths by 50% or more. Dissolved oxygen remained low. Simulated diversion of the diluting effect of a heating plant effluent led to complete hyacinth takeover and much greater seasonal oscillations in the chemical parameters. Simulated hyacinth control caused the greatest dissolved oxygen fluctuations when spraying and periodic harvesting were tested at least with continuous harvesting. It was suggested that the above-mentioned diversions were shown to be ecologically unattractive even without considering the economic costs of alternatives to lake disposAl. (Bell-Cornell)

W76-11884

INTERNATIONAL MANAGEMENT OF THE GREAT LAKES-ST. LAWRENCE BASIN,
Western Ontario University, London, Canada, Department of Geography. University of Western Ontario, London. Dept. of Geography.
For primary bibliographic entry see Field 2H.
W76-11887

CITY--INDUSTRY TEAMWORK SOLVES CRITICAL WASTEWATER PROBLEM,
W. L. Forestell.
The American City Vol 88, p 57-59, July 1973. 3 p, 3 photo.

Descriptors: *Public utilities, *West Virginia, *Waste water disposal, *Waste water treatment, *Chemical wastes, *Sewage, Water pollution control, Pollution abatement, Water pollution sources, Waste disposal, Landfills, Waste water(Pollution), Sewage effluents, Water quality.

When the West Virginia Department of Natural Resources first initiated a program for upgrading the quality of the Kanawha River, both the City of South Charleston and the area's largest industry faced a problem of waste treatment. Instead of building separate facilities the city and Union Carbide Corporation cooperated in building a single plant capable of treating both domestic and industrial waste. Phase one of the project has been in operation since 1963, providing total primary and partial secondary treatment for wastewaters. Phase two, which began operation in 1968, provides total secondary treatment. Phase three is under construction and will be used only for industrial wastes. Initial costs were split between city and industry users with industry paying 90% of annual operating costs. Because the plant is city owned, however, Union Carbide has not become engaged in the legal entanglements a public utility usually encounters. It has nevertheless been in a position to exercise co-control with the city over operations. This cooperative experiment in waste treatment has achieved a marked increase in river water quality. (Comer-Florida)
W76-11891

THE SEPTIC TANK--A METHOD OF SEWAGE DISPOSAL FOR PRIVATE OR PUBLIC BUILDINGS,
Arizona State Dept. of Health Services, Phoenix.
For primary bibliographic entry see Field 5D.
W76-11892

MINIMUM REQUIREMENTS FOR DESIGN, SUBMISSION OF PLANS AND SPECIFICATIONS OF SEWAGE WORKS.
Arizona State Dept. of Health Services, Phoenix.
For primary bibliographic entry see Field 5D.
W76-11893

INTERIM REPORT, COOPERATIVE GRAYS HARBOR SURVEILLANCE PROGRAM-1970,
Washington State Dept. of Ecology, Olympia. Office of Technical Services.
For primary bibliographic entry see Field 5D.
W76-11894

REQUIRING POLLUTERS TO PAY FOR AQUATIC NATURAL RESOURCES DESTROYED BY OIL POLLUTION,
Office of the Judge Advocate General (Navy), Washington, D. C.
L. D. Wood.
Natural Resources Lawyer, Vol 8, p 545-609 (1976). 65 p, 300 ref.

Descriptors: *Oil pollution, *Legal aspects, *International law, *Oil spills, *Oil industry, International waters, Water pollution sources, Wastes, Disasters, Waste water, Waste water(Pollution), Oily water, Chemical wastes, United Nations, Water pollution.
Identifiers: *Oil Pollution Act, *Absolute liability.

The present system of civil liability for oil pollution is incomplete. Left partially or wholly unprotected are the private victim and the publics' recreation and natural resources. International uniformity can be gained by U. S. ratification of the Inter-Governmental Maritime Consultative Organization Liability and Fund Conventions. For domestic protection, a comprehensive U. S. Domestic Oil Pollution Liability and Compensation System should be enacted. These plans are discussed at great length here. Finally, any domestic plan must be both federal and uniform so as to prevent divergent state remedies. A primary theme is that civil liability for the full consequences of environmental harm is necessary. (Frank-Florida)
W76-11898

BIOLOGICAL CONTROL OF WATER WEEDS WITH PLANT PATHOGENS,
Florida Univ., Gainesville. Dept. of Plant Pathology.
For primary bibliographic entry see Field 4A.
W76-11904

ENCRUSTATION,
Plummer and McDannald Co., Galena, Ohio.
For primary bibliographic entry see Field 8G.
W76-11912

METHOD OF CONTROL OF LAND AND WATER USES IN THE COASTAL ZONE,
George Washington Univ., Washington, D. C.
For primary bibliographic entry see Field 6E.
W76-11922

EVALUATION OF A PNEUMATIC BARRIER FOR OIL CONTAINMENT,
Calspan Corp., Buffalo, N. Y.
J. M. Grace.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-249 361, $5.00 in paper copy, $3.00 in microfiche. Environmental Protection Agency, Environmental Protection Technology Series No. EPA-600/2-76-030, Febuary 1976. 79 p, 42 fig, 14 ref. WPRD 263-01-68.

Descriptors: *Oil pollution, *Rivers, *Water pollution control, Water quality control, *Barriers, *Mechanical equipment, Equipment, Water pollution control, *New York, *Separation techniques.
Identifiers: Pneumatic barriers, *Buffalo River(NY).

The development and evaluation of a pneumatic barrier for restraining the natural flow of surface oils in the Buffalo River is reported. The initial phase of the study involved laboratory experiments to evaluate the surface currents produced by buoyant air-water plumes which were formed by the injection of air through single and multiple orifices submerged below the water surface. Based upon the data obtained in the laboratory experiments, a full scale, prototype air barrier system was designed. This barrier system was built and installed in the river. A full scale test program was initiated in order to evaluate the performance of the barrier. Following the river test phase of the program, additional laboratory tests were conducted in a water channel facility to investigate the performance of a barrier system at higher currents and for different oil types than were available in the Buffalo River. It was determined that a pneumatic barrier could be an effective device for stopping the flow of surface oils for currents less than one foot per second. The actual limiting speed for a particular oil was a function of its viscosity and specific gravity. In no instance was any oil that was tested restrained in a current of more than 1.5 fps. (Sinha-OEIS)
W76-11923

FAST CURRENT OIL RESPONSE SYSTEM,
Tetradyne Corp., Richardson, Tex.
F. N. Mueller.
Available from the National Technical Information Service, Springfield, Va 22161, as AD/A-020 171, $5.00 in paper copy, $3.00 in microfiche. U. S. Coast Guard Final Report No. USCG-D-115-75, April 1975. 63 p, 26 fig, 8 tab, append. DOT-CG-40220-A.

Descriptors: *Oil spills, *Water quality control, *Pollution abatement, *Resources development, *Environmental effects, *Computer programs, Water resources, Barriers, Skimming, *Separation techniques.
Identifiers: Outer Continental Shelf, Booms, Oil skimmers, System design, Air boom tests.

A relative velocity can be imparted to a floating oil slick by moving an air jet across the surface of the water. If two long booms are arranged in a 'V' shape and moved across an oil slick, the oil will be blown into a concentrated strip which can then be collected with a suitable collector. The collector application in this study used a flow-through trough and a second air boom to skim the oil off the surface and into an oil concentrator. The complete unit was tested by the University of Michigan at speeds up to 7 ft/sec. The 'Vee' air booms did an excellent job of 'herding' the oil with efficiencies ranging from 100% at 1 ft/sec to 80% at 7 ft/sec. The development of the collector did not reach a point where good efficiencies could be obtained above 4 ft/sec. As a part of the program a flow test tank was constructed with a test section 15 feet long, 4 feet wide, and 3 feet deep. The tank would give flow velocities up to approximately 1 ft/sec. (Sinha-OEIS)
W76-11928

DEVELOPMENT AND PRELIMINARY DESIGN OF AN EXPERIMENTAL PROTOTYPE FREE VORTEX OIL SKIMMER,
Scientific Associates, Inc., Santa Monica, Calif.
E. B. Nebeker, and S. E. Rodriguez.
Available from the National Technical Information Service, Springfield, Va 22161, as AD-A02 174, $5.00 in paper copy, $3.00 in microfiche. U.S. Cast Guard Final Report No. USCG-D-152-7 June 1975. 93 p, 22 fig, 17 ref, append. DOT-CG 42732-A.

Descriptors: *Oil spills, *Oil pollution, *Skimming, *Pollution abatement, *Water quality control, Water pollution, Resources development, Vortices, *Separation techniques.
Identifiers: Outer Continental Shelf, *Oil skimmers.

An experimental prototype Free Vortex skimmer is described. Results indicate that the development of the Free Vortex has produced a skimmer system which possesses almost all of the performance characteristics usually considered desirable in an oil skimmer. The system is particularly applicable to the operating conditions of: films 2-inch thick and less, operation while stationary and in currents up to 0.75 knots, and severe Sea State 4 waves. The utility of this concept is not limited to these particular conditions but includes many other situations and operating modes. The Free Vortex oil skimmer, with a maximum oil recovery rate of 250 to 300 gpm and fitted with a comminutor/macerator to process debris will weigh about 1300 pounds. The largest dimension is 12 feet when deployed and can be collapsed to 6 feet for transportation. Objectives of the development portion of this program are to develop and improve surface oil capture, vortex generation and vortex-inflow blending, and recovery oil fraction. Results showed that upwelling behavior can be easily eliminated, vortex gen

n was improved by blending the appropriate w field more smoothly, and oil fraction was expectedly good: at a recovery rate of 120 gpm, out 100% oil was recovered at 1/4-inch and ater. (Sinha-OEIS)
6-11929

VELOPMENT OF BUOY MOUNTED DROCARBON VAPOR SENSORS FOR USE LOCAL AREA POLLUTION SURVEIL-NCE SYSTEMS,
lwest Research Inst., Kansas City, Mo.
primary bibliographic entry see Field 5A.
6-11930

RVEY STUDY OF TECHNIQUES TO EVENT OR REDUCE DISCHARGES OF ZARDOUS CHEMICALS,
elle Columbus Labs., Ohio.
C. Henderson, S. Srinivasan, and J. A. kener.
ilable from the National Technical Informa- Service, Springfield, Va 22161, as AD/A-020 $5.00 in paper copy, $3.00 in microfiche. U.S. st Guard Report No. USCG-D-184-75, August . 84 p, 26 fig, 7 tab, 6 ref. DOT-CG-23223-A.

criptors: *Hazards, *Transportation, Pollu-, *Chemical wastes, *Poisons, *Pollution ement, *Accidents, *Public health, *Water tion, *Water quality control, Equipment.
tifiers: *Hazardous materials, Cargo, Spills, prevention.

ogram was conducted to investigate both off-helf and conceptual techniques for preventing ducing the discharge of hazardous chemicals an endangered marine vessel or to stop or e the discharge from an actual leak. First, ap-mately 50 methods and/or types of equip- were identified which involved (1) patching gging a leak, (2) cargo off-loading, (3) cargo bilization, or (4) enclosure/containment of argo. Next, the compatibility of each of the pts and equipment with the CHRIS list of dous chemicals was determined on a relative This effort was primarily concerned with ad- material behavior in contact with each S chemical; however, temperature effects, sive problems, viscosity, and density were mportant parameters depending on the par- concept under consideration. The concepts hen evaluated on the basis of their relative cal compatibility in combination with overall onality (e. g. usefulness) and the various of onsite operations to which they applied. on this evaluation, a number of concepts off-the-shelf and conceptual) were identified erior with concurrent recommendations for ition or development. (Sinha-OEIS)
1931

IMINARY RESULTS WITH A PILOT T WASTE RECYCLING MARINE-CULTURE SYSTEM,
Hole Oceanographic Institution, Mass.
imary bibliographic entry see Field 5D.
1932

OMPUTER SIMULATION TECHNIQUE OIL SPILLS OFF THE NEW JERSEY-WARE COASTLINE,
Guard Research and Development Center, , Conn.
mary bibliographic entry see Field 5B.
940

IL AND GAS - AN ENVIRONMENTAL SMENT. A REPORT TO THE PRE- T BY THE COUNCIL ON ENVIRONMEN-UALITY, VOLUME 1.
on Environmental Quality, Washington,

nary bibliographic entry see Field 6G.

W76-11947

OCS OIL AND GAS - AN ENVIRONMENTAL ASSESSMENT. A REPORT TO THE PRESIDENT BY THE COUNCIL ON ENVIRONMENTAL QUALITY, VOLUME 2, (APPENODICES).
Council on Environmental Quality, Washington, D. C.
For primary bibliographic entry see Field 6G.
W76-11948

OCS OIL AND GAS - AN ENVIRONMENTAL ASSESSMENT. A REPORT TO THE PRESIDENT BY THE COUNCIL ON ENVIRONMENTAL QUALITY, VOL. 3, THE EFFECT OF NATURAL PHENOMENA ON OCS GAS AND OIL DEVELOPMENT.
Tetra Tech, Inc., Pasadena, Calif.
For primary bibliographic entry see Field 6G.
W76-11949

OCS OIL AND GAS - AN ENVIRONMENTAL ASSESSMENT. A REPORT TO THE PRESIDENT BY THE COUNCIL ON ENVIRONMENTAL QUALITY, VOL 3, TOWARD RESOLVING PROBLEMS IN OUTER CONTINENTAL SHELF TECHNOLOGY.
Resources for the Future, Inc., Washington, D. C.
For primary bibliographic entry see Field 6G.
W76-11950

OCS OIL AND GAS - AN ENVIRONMENTAL ASSESSMENT. A REPORT TO THE PRESIDENT BY THE COUNCIL ON ENVIRONMENTAL QUALITY, VOL 4, POTENTIAL ONSHORE EFFECTS OF OIL AND GAS PRODUCTION ON THE ATLANTIC AND GULF OF ALASKA OUTER CONTINENTAL SHELF.
Resource Planning Associates, Inc., Washington, D. C.
For primary bibliographic entry see Field 6G.
W76-11951

OCS OIL AND GAS - AN ENVIRONMENTAL ASSESSMENT. A REPORT TO THE PRESIDENT BY THE COUNCIL ON ENVIRONMENTAL QUALITY, VOL 5, POTENTIAL BIOLOGICAL EFFECTS OF HYPOTHETICAL OIL DISCHARGES IN THE ATLANTIC COAST AND GULF OF ALASKA.
Massachusetts Inst. of Tech., Cambridge, Mass.
For primary bibliographic entry see Field 6G.
W76-11952

OCS OIL AND GAS - AN ENVIRONMENTAL ASSESSMENT. A REPORT TO THE PRESIDENT BY THE COUNCIL ON ENVIRONMENTAL QUALITY, VOL 5, SIMULATION OF HYPOTHETICAL OFFSHORE PETROLEUM DEVELOPMENTS.
Massachusetts Inst. of Tech., Cambridge, Mass.
For primary bibliographic entry see Field 6G.
W76-11953

OCS OIL AND GAS - AN ENVIRONMENTAL ASSESSMENT. A REPORT TO THE PRESIDENT BY THE COUNCIL ON ENVIRONMENTAL QUALITY, VOL 5, ANALYSIS OF OIL SPILL STATISTICS.
Massachusetts Inst. of Tech., Cambridge, Mass.
For primary bibliographic entry see Field 6G.
W76-11954

OCS OIL AND GAS - AN ENVIRONMENTAL ASSESSMENT. A REPORT TO THE PRESIDENT BY THE COUNCIL ON ENVIRONMENTAL QUALITY, VOL 5. OIL SPILL TRAJECTORY STUDIES FOR ATLANTIC COAST AND GULF OF ALASKA.
Massachusetts Inst. of Tech., Cambridge, Mass.
For primary bibliographic entry see Field 6G.

W76-11955

OPTIMIZATION OF WATER RESOURCES DEVELOPMENT PROJECTS IN CASE OF INADEQUATE HYDROLOGIC DATA,
Research Inst. for Water Resources Development, Budapest (Hungary).
For primary bibliographic entry see Field 6A.
W76-11971

COMPENSATION FOR OIL POLLUTION AT SEA: AN INSURANCE APPROACH,
San Diego Univ., Calif. School of Law.
C. F. Goria.
Federation of Insurance Counsel Quarterly, Vol 26, p 3-26 (Fall 1975). 24 p, 133 ref.

Descriptors: *Insurance, *Oil spills, *Water pollution sources, *Oil wastes, *Waste water(Pollution), Waste water disposal, Water pollution, Chemical wastes, Oil industry, Oily water, Ships, International law, International commissions, Civil law.

Monetary damages from oil spill accidents, including cleanup costs and private claims, are inequitably distributed under present liability principles. The author reviews several national approaches to insurance and finds them inadequate, mainly due to extreme limitations of liability. The 1969 Civil Liability Convention, the International Compensation Fund, the Tanker Owners Voluntary Agreement Concerning Liability for Oil Pollution, and the Contract Regarding an Interim Supplement to Tanker Liability for Oil Pollution all go a long way towards but do not protect private claims. The author suggests the deletion of all liability limits on all but private claims. Private claims should be handled by the International Compensation Fund. Loss distribution should involve the shipping industry through higher premiums, the oil companies through higher shipping costs, and the consumer through higher prices. (Frank-Florida)
W76-11975

WETLAND'S RELUCTANT CHAMPION: THE CORPS TAKES A FRESH LOOK AT 'NAVIGABLE WATERS',
Lewis and Clark Coll., Portland, Oreg. Northwestern School of Law.
For primary bibliographic entry see Field 4A.
W76-11976

ENVIRONMENTAL LAW--STATUTORY INTERPRETATION--THE ENVIRONMENTAL PROTECTION AGENCY ENTERS THE NUCLEAR AGE--COLORADO PUBLIC INTEREST RESEARCH GROUP, INC V TRAINS 507 F2D 743 (10TH CIR 1974),
J. A. Christopher.
Suffolk University Law Review, Vol IX, p 1512-23 (1975). 12 p.

Descriptors: *Federal Water Pollution Control Act, *Administrative agencies, *Nuclear wastes, *Radioactive wastes, *Nuclear power plants, Water pollution, Federal government, Regulation, Colorado, United States, Rivers, Navigable waters, Nuclear energy, Nuclear reactors, Radiation, Radioactivity, Permits.
Identifiers: *FWPCA Amendments of 1972.

The question of whether the discharge of radioactive waste into navigable waters should be regulated by the Environmental Protection Agency or the Atomic Energy Commission (AEC) was decided by a Federal Court of Appeals in 1974, when a citizens' group brought suit to compel the EPA to set limitations on the discharge of radioactive materials from two nuclear facilities into Colorado rivers. The citizens' group contended that the Federal Water Pollution Control Act Amendments of 1972 clearly place the responsibility for regula-

tion of any pollutants on the Environmental Protection Agency (EPA). The EPA, however, argued that the legislative history of the Amendments indicated Congress' intent to exclude special nuclear materials, and that the Atomic Energy Act of 1954 gave the AEC exclusive power over such matter. The Court of Appeals for the Tenth Circuit held that the term 'pollution' as used in the Amendments is unambiguous, and does not exclude any radioactive materials; furthermore, the Atomic Energy Act should not be interpreted so as to divest the EPA from primary responsibility over regulation of any pollution of navigable waters. The court's rationale and the possible impact of the decision are discussed in detail. (Sloan-Florida)
W76-11979

NITRATE POLLUTION AND THE CALIFORNIA ENVIRONMENTAL QUALITY ACT: THE APPROPRIATE SOLUTION TO A NEGLECTED PROBLEM,
L. R. Skidmore, III.
California Western Law Review, Vol. 12, No. 1, p. 122-41 (1975). 20 p, 1 chart.

Descriptors: *California, *Permits, *Nitrates, *Agricultural runoff, *Water pollution control, Federal government, Legislation, Legal aspects, Regulation, Pollution, Administrative agencies, Federal Water Pollution Control Act, Governmental interrelations, State governments, Environmental control, Projects, Local governments, Pollutant identification, Water pollution, Environmental effects.
Identifiers: *National Environmental Policy Act, *California Environmental Quality Act, Environmental impact statement.

The Congress, the Federal Courts, the California legislature and state agencies have all failed to regulate nitrate pollution. The failure to regulate this important source of agricultural groundwater pollution has resulted in the degradation of agricultural product, reduced milk production, and the contamination of drinking water. This comment suggests the viability of applying the California Environmental Quality Act (CEQA) to solve the nitrate pollution problems in California. This would be accomplished through the registration and licensing of fertilizers. CEQA will be applied to those activities sought to be licensed which have discretionary governmental approval as 'statutory projects'. In addition, the activity must have significant and positive environmental effects in order to be licensed. If these factors are met, a Draft Environmental Impact Report (EIR) containing detailed descriptions of the fertilizer registration and licensing project must be prepared and accepted. CEQA will be applied through existing administrative procedures within the California Department of Agriculture. (Hadoulias-Florida)
W76-11981

PROTECTION OF THE MARINE ENVIRONMENT,
National Petroleum Council, Washington, D. C. Committee on Ocean Petroleum Resources.
C. C. Smith, Jr, L. W. Finlay, and M. S. McKnight.
Natural Resources Lawyer, Vol 8, No 3, p 511-33 (1975). 25 p, 1 tab.

Descriptors: *Oil industry, *Oil spills, *Law of the sea, *International commissions, *Water pollution sources, Oil, Oil wastes, Water pollution, Oil pollution, Oceans, Conservation, Sea water, Water pollution control, Legal aspects, Ecology, Pollutants, International law, Water law, Exploration, Effluents, Jurisdiction, Regulation.
Identifiers: *Marine pollution, Oceanic ecosystem, Environmental impact.

Since 1968 the National Petroleum Council has undertaken four studies to assist the government in formulating policies in preparation for the United Nations Law of the Sea Treaty negotiations. This article is an extract of one such study dealing with marine oil pollution. Marine petroleum pollution has four major sources. Of these the largest source is land based activities, which account for about 55% of sea pollution. Regulation in this area, however, is primarily a national responsibility beyond the treaty scope. The pollution resulting from natural phenomena is also beyond treaty scope and not discussed. The remaining pollution sources are vessels and offshore production. Of the two, vessel pollution is by far the greater; as a result, several international conventions and informal agreements already exist relating to vessel design, waste treatment, and discharge limitations. The Inter Governmental Maritime Consultative Organization (IMCO) is largely responsible for the improvements. The National Petroleum Council recommends that, because of its past success and experience, IMCO be named as administrative agent for any new international standards. (Comer-Florida)
W76-11982

THE SETTLEMENT OF INTERNATIONAL ENVIRONMENTAL DISPUTES,
Wisconsin Univ., Madison. School of Law.
For primary bibliographic entry see Field 6E.
W76-11983

OIL, SUPER-SHIPS AND THE OCEANS,
J. Frye.
Oceans, Vol. 74, p. 48-55, Jan. 1974. 8 p, 3 photo, 1 dwg, 1 tab.

Descriptors: *Ships, *Oil spills, *Design standards, *Costs, Water pollution control, Transportation, Washington, California, Oil, Oil pollution, Water pollution, Water quality, Water quality control, Environmental effects, Port authorities, Planning, Pollution abatement, Research equipment, Energy, Research priorities, Water quality act, Bacteria, Coasts.

The era of superships has arrived. Supertankers transporting petroleum are expected to present great water pollution problems. Consequently, there has been growing public resistance to the construction of port facilities to accomodate these great ships. The oil companies have responded by promising to pay for various oil spill prevention measures if new shore facilities are approved. The institute for Water Resources ordered studies analyzing the potential water pollution problems from the supertankers. The results of these studies suggest that further research be conducted to explore methods of reducing the possible pollution impact of tankers on coastal waters and shores. Also examined are various water pollution and oil pollution prevention acts having provisions governing tanker design and oil spill control methods, and recent Navy efforts at developing strains of bacteria which consume oil. (Hadoulias-Florida)
W76-11985

THE INTRACOASTAL WATERWAY: AN ECOLOGICAL PERSPECTIVE,
Florida Atlantic Univ., Boca Raton. Dept. of Biological Sciences.
G. A. Marsh.
Florida Environmental and Urban Issues, Vol. 11, No. 2, p. 6-7, 13-15(1974). 4 p, 1 photo.

Descriptors: *Florida, *Ecology, *Water quality control, *Human population, *Canals, Recreation, Southeast U. S., Projects, Biota, Biological communities, Dominant organisms, Protection, Water resources, Pollution, Water pollution, Canals, Project planning, Water management(Applied), Mangrove swamps, Water quality, Water policy, Water treatment, Water pollution sources, Waste disposal, Navigation, Natural resources.
Identifiers: *Intracoastal Waterway, *Water Quality Management Plan.

The Intracoastal Waterway (ICWW) connects a series of inland marine water bodies of the Gold Coast and provides a protected boating passage linking the coastal municipalities. It also serves various recreational, drainage and waste disposal needs of Palm Beach, Broward and Dade Counties. Burgeoning population growth has severely lowered water quality in these and other counties. In addition, continuing demand for waterfront acreage has devastated natural shoreline vegetation along inland marine waters. Growing populations have also resulted in sewage wastes entering the inland marine waters. To counteract this condition, centralized collection and treatment systems using non-polluting disposal techniques must be developed. In addition to sewage wastes, other sources of pollution include partially treated domestic wastes, surface runoff from agricultural and urban areas, and decayed organic matter from water hyacinths. The demand for finger-canal developments has resulted in pesticides, grass and shrubbery clippings and other wastes accumulating and decomposing within the canal system. The development of waterfront homesites has also resulted in the devastation of Palm Beach County's mangrove habitat, an area critically important to the coastal ecosystem. Hopefully, implementation of the recently adopted Water Quality Management Plan will improve the quality of the surface waters within Palm Beach County. (Hadoulias-Florida)
W76-11986

EFFLUENT LIMITATIONS GUIDELINES FOR EXISTING SOURCES AND STANDARDS OF PERFORMANCE AND PRETREATMENT STANDARDS FOR NEW SOURCES FOR THE PAVING AND ROOFING MATERIALS (TAR AND ASPHALT) POINT SOURCE CATEGORY.
Environmental Protection Agency, Washington, D. C.
Federal Register, Vol 40, No 143, p 31190-95, Jul 24, 1975. 6 p, 11 tab.

Descriptors: *Asphalt, *Standards, *Effluents, *Treatment facilities, *Roofing materials, Paving, Asphaltic concrete, Construction materials, Federal Water Pollution Control Act, Water pollution, Water pollution sources, Water quality, Waste water treatment, Pollutants, Regulation, Administrative agencies, Federal government.
Identifiers: *Administrative regulations, *FWPC Amendments of 1972.

Pursuant to the authority of the Federal Water Pollution Control Act, the Environmental Protection Agency has proposed effluent limitations and guidelines for existing sources and standards of performance for new sources in the paving and roofing materials category. Tables are given setting forth in both English and metric units the standards for each subcategory. Limitations are specified for TSS, pH, and oil and grease. The subcategories covered by the regulation are asphalt emulsion, asphalt concrete, asphalt roofing, and linoleum and printed asphalt felt. The inflationary impact of the proposed regulation is considered to be insignificant. (Capehart-Florida)
W76-11989

COMPREHENSIVE OIL POLLUTION LIABILITY AND COMPENSATION ACT OF 1975.
U. S. Code Cong and Admin News, p 1512, 1975, 9 p.

Descriptors: *Remedie, *Compensation, * spills, *Federal jurisdiction, Resources development, Legislation, Federal-state water rights, Conflicts, Resources, State jurisdiction, Damage, High seas, Regulation, Administration, Water l Environmental effects, Oil pollution, Water pollution, Oil wells, Oil industry.
Identifiers: *Standing(Legal), *Sovereign immunity, *Absolute liability, Coastal waters, Coastal zone management, Territorial seas(Jurisdiction

n July 9th, President Ford submitted to Congress special message to accompany his proposed omprehensive Oil Pollution Liability and Com- ensation Act of 1975. This legislation, according the President, would establish a comprehensive d uniform system for fixing liability and settling ims for oil pollution damages in United States aters and coastlines. The proposal would also im- ement two international conventions dealing th oil pollution by tankers on the high seas. To event further oil pollution, the legislation would ablish strict liability for pollution damages from ntifiable sources and would provide economic entives to operators to prevent oil spills. In ad- ion to defining liability for oil spills, it would ablish a uniform system for settling claims and assuring that none will go uncompensated, ile at the same time replacing a patchwork of rlapping and sometimes conflicting Federal State laws. (Reinders-Florida)
6-11990

VIEW OF PROJECTS AFFECTING SOLE URCE AQUIFERS, EDWARDS UN- RGROUND RESERVOIR, TEXAS AREA; IN- IM PROJECT REVIEW GUIDELINES.
ironmental Protection Agency, Washington, .
eral Register, Vol 40, No 242, p 58292-94, ember 16, 1975. 3 p.

criptors: *Aquifers, *Potable water, *Public th, *Texas, *Water sources, Financing, ernment finance, Reservoirs, Recharge, Tox- , Water quality, Federal government, River as, Groundwater recharge, Groundwater urces, Underground storage, Water pollution, es, Projects, Project planning, Federal po- olicy, Administrative agencies, Regulation.
ifiers: Administrative regulations, Environ- al impact statement, Edwards Underground rvoir(Tex).

ant to its authority under the Safe Drinking r Act, the Environmental Protection Agency) has determined that the Edwards Un- ound Reservoir is a principal source of drink- ater for the San Antonio, Texas, area. Since ion of this aquifer would create a significant health hazard, federal funds will not be pro- for any project which might contaminate the r through the recharge zone. The EPA has ished guidelines for review of major, lly-assisted programs or actions which may the water quality of the aquifer. Provisions de for initiating review of a project, for giv- tice of the review to the originating federal and to the public, and for holding public gs on the projects. Factors to be considered project review include the following: the ex- the health hazard; preventive or mitigating res that could be taken; state or local con- ver the release of contaminants; expected s of the project; and, the cumulative impact roject. (Capehart-Florida)
1991

ANIC CHEMICALS MANUFACTURING SOURCE CATEGORY.
nmental Protection Agency, Washington, D.

Register, Vol. 40, No. 100, p. 22402-23, 1975. 22 p, 15 tab.

tors: *Inorganic compounds, *Federal ollution Control Act, *Pollutant identifica- egislation, *Chemical wastes, Technology, ts, Standards, Analytical techniques, l analysis, Water pollution, Chemicals, n abatement, Legal aspects, Legislation, ive analysis, Chemcontrol, Federal ent, Administration, Administrative agen- ndards, Classification.
rs: *FWPCA Amendments of 1972, urces(Pollution).

Pursuant to the authority of the Federal Water Pollution Control Act, the Environmental Protection Agency (EPA) has proposed effluent limitations and guidelines for existing sources and standards of performance and pretreatment standards for existing and new sources in the inorganic chemical manufacturing point source category. Section 306 of the Act requires pollutant discharge control through application of the best available technology. The point source category was studied to determine whether separate limitations are appropriate for different segments within the category. In addition, the control and treatment technologies existing within each segment were identified and the information evaluated. Subsequently, the significant inorganic products segment of the inorganic chemicals manufacturing category was divided into forty-one discrete sub-categories consistent with the specific chemicals produced. Discussion of listed process wastes water pollutants generated by the manufacture of significant inorganic products is included. (Hadoulias-Florida)
W76-11992

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM: SEPARATE STORM SEWERS.
Environmental Protection Agency, Washington, D. C.
Federal Register, Vol 40, No 235, p 56932-36, December 5, 1975. 5 p.

Descriptors: *Permits, *Storm drains, *Urban drainage, *Storm runoff, Pollutants, Regulation, Agricultural runoff, Industrial wastes, Standards, Effluents, Structures, Pipes, Surface runoff, Cities, Sewers, Separated sewers, Urbanization, Judicial decisions, Administrative agencies, Federal government, State governments, Federal Water Pollution Control Act.
Identifiers: *Administrative regulations.

As directed by order of the federal district court, the Environmental Protection Agency (EPA) has proposed regulations extending the National Pollutant Discharge Elimination System (NPDES) permit system to include point sources in the separate storm sewer category. This category had previously been exempted since the EPA considers that runoff sources are nonpoint in nature and more properly regulated under the Federal Water Pollution Control Act. The proposed regulations define a separate storm sewer as a publicly-owned, urban area pipe system used for the purpose of collecting storm runoff uncontaminated by industrial or commercial wastes. The regulations authorize the discharge of pollutants from separate storm sewers subject to a permit procedure and other requirements which may be prescribed in future regulations. In addition, a discharger may be required to obtain a conventional NPDES permit at anytime. (Capehart-Florida)
W76-11993

OFFSHORE SEGMENT OF THE OIL AND GAS EXTRACTION POINT SOURCE CATEGORY.
Environmental Protection Agency, Washington, D. C.
Federal Register, Vol 40, No 179, p 42572-77, September 15, 1975. 6 p, 5 tab.

Descriptors: *Standards, *Effluents, *Water pollution sources, *Federal Water Pollution Control Act, Drilling, Oil, Natural gas, Mud, Sands, Administration, Regulation, Administrative agencies, Oceans, Waste water(Pollution), Water pollution, Federal government, Drilling fluids, Pollutants.
Identifiers: *Point sources(Pollution), Administrative regulations, Offshore oil drilling.

Pursuant to the Federal Water Pollution Control Act, the Environmental Protection Agency (EPA) is publishing regulations providing guidelines for effluent limitations and pretreatment standards for existing sources and pretreatment standards and standards of performance for new sources in the near-offshore and far-offshore sub-categories of the offshore segment of the oil and gas extraction point source category. Tables establishing the quantity or quality of pollutants or pollutant properties which may be discharged by a point source subject to specified provisions are included. The pollutant sources tabulated are deck drainage, drilling muds, drill cuttings, well treatment, sanitary, domestic, produced sand and produced water. (Capehart-Florida)
W76-11994

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION -- OVERSIGHT HEARINGS.
For primary bibliographic entry see Field 6E.
W76-11999

THE FREEDOM OF NAVIGATION AND THE PROBLEM OF POLLUTION OF THE MARINE ENVIRONMENT,
Gosudarstvennyi Proektno-Izyskatelskii i Nauchno-Issledovatelskii Institut Morskogo Transporta 'Soyuzmorniiproekt', Moscow (USSR).
V. A. Kiselev.
Georgia Journal of International and Comparative Law, Vol 6, p 93-106 (1976). 14 p, 75 ref.

Descriptors: *International law, *United Nations, *Water pollution control, *Oceans, *Law of the sea, Navigation, Water pollution, Marine biology, Legal aspects, Oil spills, Oil wastes, Water policy, Foreign countries, International commissions.

The law of the sea with regard to pollution prevention and liability is changing rapidly. Standards for the prevention of pollution from vessels have been adopted, but standards concerning a ship's construction and equipment should also be adopted on the international level. For their further protection, coastal states should be provided with some rights for combatting pollution within a zone of the high sea bordering on their territorial waters. It would also be helpful if divergent rules and standards concerning pollution prevention among coastal states could be unified for reasons of protection and enforcement. (Frank-Florida)
W76-12010

LIABILITY FOR MARINE ENVIRONMENT POLLUTION DAMAGE IN CONTEMPORARY INTERNATIONAL SEA LAW,
Gosudarstvennyi Proektno-Izyskatelskii i Nauchno-Issledovatelskii Institut Morskogo Transporta 'Soyuzmorniiproekt', Moscow (USSR).
A. L. Makovsky.
Georgia Journal of International and Comparative Law, Vol 6, p 59-71 (1976). 13 p. 73 ref.

Descriptors: *International commissions, *Treaties, *Law of the sea, *Marine biology, Oceans, Oil wastes, Oil spills, Water pollution, Sources, Water pollution treatment, Fish populations, United Nations, *Water pollution control, Pollutants, Fishkill, Compensation, International law.

Examined here are the various international conventions dealing with liability for harm to the marine environment. They include conventions providing protection against oil and nuclear waste, as well as against fishkill. A form of international tort law forms the basis for these conventions. In the Third UN Conference on the Law of the Sea, efforts have been made to include and refine these liability principles into a new law of the sea. Draft articles are presented from the U.S., Australia, Norway, Germany, Canada and other countries. The concept of state liability is only just beginning to take hold. (Frank-Florida)
W76-12011

RESPONSIBILITY AND LIABILITY FOR HARM TO THE MARINE ENVIRONMENT,
International Inst. for Environment and Development, Washington, D.C. North American Office
R. E. Stein.
Georgia Journal of International and Comparative Law, Vol 6, p 41-57 (1976). 17 p, 76 ref.

Descriptors: *International commissions, *International law, *Marine biology, *Oceans, Oil wastes, Oil spills, Water pollution sources, Water pollution treatment, Fish populations, United Nations, *Water pollution control, Pollutants, Fish-kill, Compensation, Water law.

Harm to the marine environment is not being dealt with sufficiently at present. No catalyst exists that would push nations into preventing marine harm or compensating its victims. Transport discharges and wastes, dumping and fish depletion are some of the harms sought to be prevented. Existing control measures exist, and are enumerated here, but they are inadequate. Recommendations are made for new measures to prevent marine harm. (Frank-Florida)
W76-12012

ZERO DISCHARGE: NATIONAL GOAL OR NATIONAL CALAMITY,
Allied Chemical Corp., New York.
J. T. Connor.
Vital Speeches of the Day, Vol 39, p 290-93, March 1, 1972. 4 p.

Descriptors: *Waste treatment, *Water quality standards, Cost-benefit analysis, *Economic impact, *Economic feasibility, Feasibility, Social values, Water policy, Regulation, Water quality control, Water pollution control, Pollution abatement.

A goal of zero discharge of pollutants into the nation's waters, the goal set by the Muskie Bill proposed in 1971, may have financial and human resource costs too high to pay. This speech by the chairman of the board of Allied Chemical Corporation discusses the possible costs and effects of such a goal. Whatever pollution control costs are incurred will eventually be paid by consumers and tax payers. Therefore, arbitrary goals should not be set without careful evaluation. Total pollution control has been conservatively estimated to cost more than 90 billion dollars. Some estimates run as high as 2 or 3 trillion dollars. The question to be answered is whether 100% control is necessary and desirable in the face of such costs. Lesser standards should be considered. A plan to project 100% control while allowing for 'mid-course correction' does not reduce the cost damage but adds the additional problem of passing laws that cannot be obeyed. Before Congress establishes control standards, it must set attainable, balanced goals. (Comer-Florida)
W76-12014

THE ROLE OF NORTH AMERICAN DEEP WATER PORTS,
G. A. Regan.
Vital Speeches of the Day, Vol. 39, p. 455-458, March 26, 1973. 4 p.

Descriptors: *North America, *Oil spills, *Oil industry, *Ships, *Harbors, *Canada, Import, Economic feasibility, Economic efficiency, Employment, Anchors, Naval architecture, Engineering, Energy, Navigation, Deep water.
Identifiers: *Coastal zone management, *Deepwater ports, *Nova Scotia.

Because Americans are consuming their own available fuel at a very high rate, imported oil is essential to the American economy. Projections estimate that by 1985 as much as 15 million barrels will have to be imported every day. The United States, however, has no ports capable of handling the very large crude carriers (VLCCs) which are the most economic transportation means. Since no American ports are even capable of alteration to suit increased needs, this article proposes use of Canadian, Bahama and Carribean ports for U.S. oil unports. Canadian ports are close enough to the heavy oil use areas of the northeastern U. S. to present a viable alternative. Moreover, Canadian ports are already capable of receiving VLCCs. Should the U.S. agree to use of Canadian ports, however, it must recognize that the Canadian government and people may not be willing to assume spillage risks for mere transportation income. The Canadian government will also likely require the construction of oil refineries which could provide Canadian oil workers with jobs previously performed by American workers in U.S. located refineries. (Comer-Florida)
W76-12015

SALT MARSHES-ECOSYSTEMS IN DANGER,
Cape Cod Museum of Natural History, Brewster, Mass.
J. Hay.
National Parks and Conservation Magazine, Vol 48, p 16-21 March 1974. 6 p, 1 illus, 11 photo.

Descriptors: *Marshes, *Coastal marshes, *Wetlands, *Estuarine environment, *Dredging, *Salt marshes, Tidal marshes, Waterfowl, Shellfish, Commercial shellfish, Pollution, Commercial fishing, Aquatic life, Aquatic environment, Sport fishing, Estuarine fisheries, Wildlife, Pollution.
Identifiers: *Coastal wetlands, *Dredge and fill operations.

There is an urgent need to strengthen laws for the protection of existing wetlands and for increasing general awareness of the unique value of wetlands. Commercial waterfront developments currently being undertaken for immediate economic gain often destroy critically needed marshlands. The result is that tidal flow is reduced and the marshes lose their ability to sustain living organisms. This leads to a decrease in the numbers and kinds of larger creatures which feed on these organisms. This decrease affects not only wildlife, which are thought of as aesthetically enriching, but also salt-water fish of considerable commercial value. The sport fishing and shellfish industries are also affected since they are dependent on spawning grounds in the coastal wetlands. Protection of the coastal areas may be accomplished through the passage of regulatory legislation and, when sufficient funds are availabl, through the outright acquisition of marshlands through state and local governments. (Sloan-Florida)
W76-12016

SUPERPORTS: THE NEED IS COMING,
Federal Maritime Commission, Washington, D. C.
A. C. Barrett.
Vital Speeches of the Day, Vol 40, p 712-714, August 22, 1974. 3 p.

Descriptors: *Oil spills, *Offshore platforms, *Harbors, *Oil industry, *Ships, Transportation, Economics, Economic efficiency, Economic justification, Water pollution sources, Foreign trade, Import, Legislation, Coastal structures.
Identifiers: Coastal waters, Coastal zone management, Absolute liability.

While the largest tanker at the end of World War II was 18,000 tons, today's tankers range up to 100,000 tons. Unfortunately, the United States is the only major world power unable to accommodate these supertankers. Explored here is the desirability of constructing huge offshore superports capable of handling supertankers. Environmentalists, actively opposing superport construction in the Atlantic, are correct in noting that the risk of oil spill from supertankers is unknown. These tankers are of recent invention and their ability to survive storms and other catastrophes has not been tested. Nevertheless, despite the fact that a spill from such a huge ship could be disastrous, economic factors of effluent oil transportation weigh in favor of supertankers and superports. In addition, an oil receiving facility located well off the coasts would reduce the threat of collision and vessel groundings. As to potential damages resulting from spills, recent congressional proposals provide for a hundred million dollar per accident fund to provide compensation on a no fault basis. (Comer-Florida)
W76-12017

HOW MODERN TECHNOLOGY IS ENDANGERING OUR LIVES: OCEAN POLLUTION,
J. E. J. Piccard
Vital Speeches of the Day, Vol 39, p 179-18
December 3, 1972. 4 p.

Descriptors: *Water pollution effects, *Mari microorganisms, *Food abundanc *Phytoplankton, *Water quality, Water pollut control, Aquatic microbiology, Aquatic envir ment, Pollutant identification, International la Air pollution, Soil contamination, Thermal pol tion, Balance of nature, Environmental effec Pesticides, International commissions.

Besides producing about 20% of the world's fo the sea contributes millions of gallons of oxyge the atmosphere. Sea life, however, is in se danger because of pollution, not only of oceans but also of the land and air. This art proposes that the preservation of sea organis requires both governmental and individual acti Private individuals must realize that biologi equilibrium requires a 50% reduction of the bi rate, a 75% reduction of resource exploitatio 20% reduction of food production and a 5 reduction of pollution. Governments must sev ly reduce or stop pollution of rivers, ban oc dumping, control direct and indirect sewerage p lution of seas, replace long life pesticides w short life ones, and require more efficient auto bile engines. The most efficient and possibly only realistic governmental control must b global authority. Reduction of ocean pollu requires reduction of all pollution because ocean is the ultimate receiver. Examples f London, Zurich and Pittsburg prove that total p lution reduction is possible in a limited ti (Comer-Florida)
W76-12018

PREPARING TO TAKE THE PLU (ATLANTIC OFFSHORE OIL),
P. J. Bernstein.
The Nation, Vol. 217, p 203-207, September 1973. 5 p, 1 map.

Descriptors: *Water resources developm *Offshore platforms, *Oil fields, *Oil s *Atlantic Ocean, *Continental Shelf, Co structures, Coastal marshes, Commercial fis Red tide, Water pollution sources, Water poll effects, Research priorities, Research development, Oily water, Oil reservoirs.
Identifiers: *Coastal zone management, Co waters, Contiguous zone.

A recent survey indicates that the Atlantic tinental shelf contains massive sedime deposits. These deposits may contain oil in qu ties exceeding the world's largest oil Offshore drilling, therefore, seems to be a matter of time. However, environmental issu lated to offshore drilling are as yet unresc This article discusses some of the issues pert to offshore drilling. Oil spillage is of utmost cern. The American Petroleum Institute a that on site spillage is a possibility. The rea cern of environmentalists, however, is the ch pipeline leaks and accidents of transfer onshore facilities. It is this type of spillag results in the worst oil slicks. Estimates in that already spilled oil, if spread throughout the oceans, would form a visibl over the entire area. Other problems with off

illing include development of coastline areas th corresponding loss of natural beauty and inju- s to fishing industries. The New England fishing lustry asserts that it could not survive Atlantic lling. Despite these problems and the recent nplete halt of ocean research, drilling seems in- table. (Comer-Florida)
'6-12019

E BATTLE OF LAKE SUPERIOR: RESERVE NING'S BIG SEWER,
Dadisman.
e Nation, Vol 218, p 592-594, May 11, 1974. 3 p, ap.

scriptors: *Minnesota, *Lake Superior, dustrial wastes, *Water pollution sources, bestos, Potable water, Effluents, Judicial deci- is, Mining, Air pollution, Administrative agen- , Standards, Density currents, Lakes, nomic impact, Public health, Social aspects, e governments, Waste disposal, Water quality, kel.
ntifiers: Wilderness areas.

r the conclusion of a federal-state enforce- t conference on cleaning up Lake Superior, Environmental Protection Agency (EPA) is- a 180-day order against a taconite procesing which had been disposing of taconite tailings the lake. At the end of the 180-day period, the brought suit in federal court to stop the harge into the lake. The court, after hearing iderable expert testimony from health offi- , found that asbestos fibers, known to be a tituent of taconite, represented a substantial c health hazard. The court thus ordered the and mine shut down until the company com- with Minnesota air and water quality stan- s. This action was taken despite claims by the any that 96,200 jobs would be threatened. court also ordered the Corps of Engineers to de safe drinking water for communities draw- ater from the lake. (Capehart-Florida)
12020

ANS, TECHNOLOGY AND LAW.
emiya Nauk SSSR, Moscow. Inst. of State aw.
rimary bibliographic entry see Field 6E.
'2025

RNATIONAL-LEGAL PROTECTION OF EAS FROM POLLUTION,
miya Nauk SSSR, Moscow. Inst. of State aw.
imary bibliographic entry see Field 6E.
2034

RNATIONAL-LEGAL PROTECTION OF IVING RESOURCES OF THE SEA,
miya Nauk SSSR, Moscow. Inst. of State w.
mary bibliographic entry see Field 6E.
2036

D ENVIRONMENTAL QUALITY.
ment of State, Washington, D.C.
mary bibliographic entry see Field 6G.
037

VALE,
d L. Holland Law Center, Gainesville, Fla.
nary bibliographic entry see Field 6E.
038

ABLE WATER, A DEFINITION: ALL UT OF SHAPE,
d L. Holland Law Center, Gainesville, Fla.
ary bibliographic entry see Field 6E.
039

AGRICULTURAL PRACTICES TO REDUCE NON-POINT POLLUTION IN THE OKEECHOBEE-KISSIMMEE BASIN,
Florida Univ., Gainesville. Inst. of Food and Agricultural Sciences.
For primary bibliographic entry see Field 6E.
W76-12041

EBB AND FLOW: NAVIGABILITY AND THE CORPS OF ENGINEERS WASHED IN THE TIDE OF ENVIRONMENTAL PROTECTION,
Spessard L. Holland Law Center, Gainesville, Fla.
For primary bibliographic entry see Field 6E.
W76-12043

FEDERAL JURISDICTION OVER LANDFILLS ON SUB-AQUEOUS LANDS,
Spessard L. Holland Law Center, Gainesville, Fla.
For primary bibliographic entry see Field 6E.
W76-12046

EFFLUENT CHARGES, TOWARDS A NEW ENVIRONMENT,
Spessard L. Holland Law Center, Gainesville, Fla.
For primary bibliographic entry see Field 6E.
W76-12048

A SURVEY OF THE VARIOUS STATE POWER PLANT SITING LAWS,
Spessard L. Holland Law Center, Gainesville, Fla.
For primary bibliographic entry see Field 6E.
W76-12050

FEDERAL REGULATION IN THE LICENSING OF NUCLEAR POWER PLANT FACILITIES,
Spessard L. Holland Law Center, Gainesville, Fla.
For primary bibliographic entry see Field 6E.
W76-12051

RESIDENTIAL DEVELOPMENT A LOOK AT THE REGULATORY CONTROLS OF FLORIDA'S WATER RESOURCES,
Spessard L. Holland Law Center, Gainesville, Fla.
For primary bibliographic entry see Field 6E.
W76-12057

DEPARTMENT OF HEALTH SERVICES (FUNCTIONS IN WATER POLLUTION CONTROL).
For primary bibliographic entry see Field 6E.
W76-12064

BOYER V DEPARTMENT OF HEALTH (THE LATITUDE OF COUNTY REGULATIONS IN REGARD TO WATER PURITY).
For primary bibliographic entry see Field 6E.
W76-12076

COMMONWEALTH DEPT OF ENVIRONMENTAL RESOURCES V BIERMAN (WATER PERMITS AND FLUORIDATION OF WATER).
For primary bibliographic entry see Field 6E.
W76-12078

VILLAGE SAFE WATER ACT.
For primary bibliographic entry see Field 6E.
W76-12082

MUNICIPAL SEWERAGE SYSTEMS (POWERS).
For primary bibliographic entry see Field 6E.
W76-12090

LOWER CONNECTICUT RIVER CONSERVATION ZONE.
For primary bibliographic entry see Field 6E.
W76-12091

DETERGENTS (RESTRICTIONS ON SALE OR USE).
For primary bibliographic entry see Field 6E.
W76-12092

PUBLIC WATER SUPPLY SYSTEMS AND WASTEWATER TREATMENT PLANTS.
For primary bibliographic entry see Field 6E.
W76-12094

ELK RIVER DEVELOPMENT AGENCY.
For primary bibliographic entry see Field 6E.
W76-12095

WATER POLLUTION--BOAT TOILET LAW.
For primary bibliographic entry see Field 6E.
W76-12103

OIL SPILL PREVENTION AND POLLUTION CONTROL ACT.
For primary bibliographic entry see Field 6E.
W76-12105

ENVIRONMENTAL CONSERVATION (WATER POLLUTION CONTROL).
For primary bibliographic entry see Field 6E.
W76-12107

UNITED STATES V KENNEBEC LOG DRIVING COMPANY (RIVER AND HARBORS ACT APPLICABLE TO LOG DRIVING ACTIVITY).
For primary bibliographic entry see Field 6E.
W76-12108

GRAIN PROCESSING CORP V TRAIN (SINGLE NUMBER EFFLUENT STANDARD AS ARBITRARY--MUST HAVE A RANGE OF NUMBERS).
For primary bibliographic entry see Field 6E.
W76-12109

CENTRAL ILLINOIS PUBLIC SERVICE CO. V. EPA (THE TAKING ISSUE AND EFFLUENT STANDARDS).
For primary bibliographic entry see Field 6E.
W76-12112

STRICT LIABILITY FOR THE DISCHARGE OF HAZARDOUS SUBSTANCES.
For primary bibliographic entry see Field 6E.
W76-12118

POWERS AND FUNCTIONS OF CITIES AND TOWNS (WATER RELATED).
For primary bibliographic entry see Field 6E.
W76-12130

WATER AND WASTEWATER TREATMENT PLANT OPERATORS.
For primary bibliographic entry see Field 6E.
W76-12131

RECREATION LAND PRESERVATION ACT OF 1971.
For primary bibliographic entry see Field 6E.
W76-12132

POLLUTION CONTROL IN MEAT, POULTRY AND SEAFOOD PROCESSING,
For primary bibliographic entry see Field 5D.
W76-12146

REGIONAL WATER QUALITY MANAGEMENT,
SEATAC Inc., Bangkok (Thailand).

H. F. Ludwig, and P. N. Storrs.
J Water Pollut Control Fed. 45(10); p 2065-2071, 2237, 1973.

Descriptors: Water quality, *Regional analysis, *Management, Programs, Projects, *Water quality control, Water pollution control, Planning.

The necessity for regional water quality management as opposed to purely local management is analyzed. Specific definition and specific objectives of such a program are outlined as well as methods for measurements of performance, problems in jurisdiction and responsibility, and the technological, financial and human resources necessary for a successful program.--Copyright 1974, Biological Abstracts, Inc.
W76-12147

SURVEILLANCE IN WATER QUALITY MANAGEMENT,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
R. C. Ward, S. R. Nichols, and G. V. Skogerboe.
J Water Pollut Control Fed. 45(10); p 2081-2087, 2237, 1973.

Descriptors: *Water quality control, *Management, *Monitoring, Data collections, Evaluation, Water pollution control.

Surveillance in water quality management becomes an end in itself rather than a means to an end. Little attempt has been made to check the accuracy of the data, utilize the information it yields, or evaluate changing data collection needs. The strategy developments that have occurred in most states, the importance of the data in the successful implementation of these strategies the failures in utilization of the data, and the proposed remedies for correcting the situation are discussed.--Copyright 1974, Biological Abstracts, Inc.
W76-12148

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

TRADE-OFF BETWEEN MODELS AND INFORMATION IN RIVER BASIN PLANNING,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources; and Arizona Univ., Tucson. Dept. of Systems and Industrial Engineering.
For primary bibliographic entry see Field 4A.
W76-11702

FLOOD CONTROL DESIGN WITH LIMITED DATA - A COMPARISON OF THE CLASSICAL AND BAYESIAN APPROACHES,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W76-11703

RESERVOIR EFFECTS ON PROPERTY VALUES ACCORDING TO LOCATION AND RURAL VS. URBAN USE,
Kentucky State Univ., Frankfort. School of Public Affairs.
For primary bibliographic entry see Field 4A.
W76-11708

RELATING ENVIRONMENTAL MODELING TO POLICY ISSUES AND DECISIONS,
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-11879

MATHEMATICAL MODELLING AND ENVIRONMENTAL DECISION-MAKING,
Department of Environment, Ottawa, Ont Canada, Environmental Systems Branch.
For primary bibliographic entry see Field 6G.
W76-11880

MODELS IN WATER QUALITY PLANNING,
Karlsruhe Univ. (West Germany). Institut fuer Siedlungswasserwirtschaft.
For primary bibliographic entry see Field 5B.
W76-11882

SYSTEMS APPROACH FOR THE PLANNING AND MANAGEMENT OF THE MORAVA RIVER BASIN, YUGOSLAVIA,
California Univ., Los Angeles. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W76-11886

RELATIONS BETWEEN PROJECT ECONOMICS AND HYDROLOGICAL DATA,
Economic Commission for Europe(UN), New York.
For primary bibliographic entry see Field 6B.
W76-11970

OPTIMIZATION OF WATER RESOURCES DEVELOPMENT PROJECTS IN CASE OF INADEQUATE HYDROLOGIC DATA,
Research Inst. for Water Resources Development, Budapest (Hungary).
A. Filotti, G. Frank, and C. Parvulescu.
In: Design of Water Resources Projects with Inadequate Data, Vol. 2, Proceedings of the Madrid Symposium, June 1973; Unesco-WMO-IAHS, Unesco-OOM-AISH, 1974, p 661-681. 4 fig, 10 ref.

Descriptors: *Water resources development, *Projects, *Optimization, *Hydrologic data, *Methodology, Systems analysis, Flow, River regulation, Water demand, Design, Operations, Flood control, Multiple purpose.
Identifiers: Dimensioning, Hydroelectric works.

The problems facing hydraulic engineers are of great diversity and decisions in their fields of activity often imply a considerable responsibility in respect to the economic consequences and the social and ecologic effects of such decisions. The operation of water resources development structures depends on the degree of knowledge available on natural data, especially on those related to hydrologic events. A great diversity of situations exists concerning available hydrologic data, covering the whole field from total lack to an acceptable volume of information. It is therefore appropriate to talk about groups or types of methodologies having a common principle, which have then to be adapted to concrete conditions and objectives of each investigated project. The methods which can be applied in case of inadequate hydrological data may be classified as follows: methods based on the generation of synthetic hydrologic sequences, such as Monte Carlo methods; methods based on the generation of hydrologic sequences by correlation with rainfall; methods based on the generalization of results of water resources engineering computations; and methods based on the theory of games. This article presents ways in which these methods can be applied in some key problems of water resources engineering: (1) the dimensioning of river flow regulating works designed for meeting water demands; (2) dimensioning of hydroelectric works; (3) design and operation of flood control developments; and (4) multi-purpose water resources development. (Bell-Cornell)
W76-11971

6B. Evaluation Process

EDUCATIONAL AND INFORMATIONA NEEDS FOR ACHIEVING PUBLIC AC CEPTANCE,
Purdue Univ., Lafayette. Ind Cooperation Exte sion Service
For primary bibliographic entry see Field 5G
W76-11640

ENVIRONMENTAL ASSESSMENT: PLANNING TOOL,
Ontario Ministry of the Environment Toron Environmental Approvals Branch.
For primary bibliographic entry see Field 6G
W76-11649

PROJECT CURE,
Environmental Protection Agency. Cincinna Ohio.
For primary bibliographic entry see Field 5D.
W76-11661

LOWER WALLER CREEK MASTER I PROVEMENT PLAN,
Taniguchi, Shefelman, Vackar, and Mint Austin, Tex.
For primary bibliographic entry see Field 5D.
W76-11662

WATER RECLAMATION: TECHNOLOGY A PUBLIC ACCEPTANCE,
Stone (Ralph) and Co., Inc., Los Angeles, Calif.
For primary bibliographic entry see Field 5D.
W76-11705

REGIONAL PLANNING FOR LAND DISPOS OF WASTEWATER,
Missouri Univ., St. Louis.
For primary bibliographic entry see Field 5D.
W76-11706

A METHODOLOGY FOR EVALUATI DEVELOPMENT-ENVIRONMENTAL C FLICTS ON WILD AND SCENIC RIVERS,
Idaho Univ., Moscow. Dept. of Agricult Economics.
For primary bibliographic entry see Field 6G.
W76-11707

THE CHALLENGE OF WATER RESOUR EDUCATION,
For primary bibliographic entry see Field 9A.
W76-11863

THE FUTURE OF THE SAVANNAH RIV PROCEEDINGS OF A SYMPOSIUM.
Clemson Univ., S.C. Water Resources Rese Inst.
For primary bibliographic entry see Field 4A.
W76-11877

SYSTEMS APPROACH FOR THE PLANN AND MANAGEMENT OF THE MOR RIVER BASIN, YUGOSLAVIA,
California Univ., Los Angeles. Dept. of Civi gineering.
For primary bibliographic entry see Field 4A.
W76-11886

PUBLIC PARTICIPATION IN WA RESOURCES DEVELOPMENT, A BIBL RAPHY.
Office of Water Research and Techno Washington, D.C.
Available from the National Technical Inf tion Service, Springfield, Va 22161 as PB-25

.00 in paper copy, $3.00 in microfiche. Water esources Scientific Information Center, Report WRT/WRSIC 76-205, August 1976, 166 p.

escriptors: *Social participation, ibliographies, *Decision making, *Planning, Vater resources development, Abstracts, Docu-ntation, Social values.
entifiers: *Public participation, Citizen par-ipation.

is report, containing 107 abstracts, is another in series of planned bibliographies in water ources produced from the Water Resources entific Information Center (WRSIC) informa-n base comprising SELECTED WATER SOURCES ABSTRACTS (SWRA). At the e of search for this bibliography, the data base 95,781 abstracts covering SWRA through il 15, 1976 (Volume 9, Number 8). Author and ject indexes are included.
5-11903

E ENVIRONMENT AND THE OFFSHORE INDUSTRY IN SCOTTISH WATERS - A VIEW. PART 2. THE REGIONAL PATTERN DECISION MAKING,
rcastle upon Tyne Polytechnic (England). t. of Humanities.
primary bibliographic entry see Field 5B.
-11946

OIL AND GAS - AN ENVIRONMENTAL ESSMENT. A REPORT TO THE PRE-NT BY THE COUNCIL ON ENVIRONMEN-QUALITY, VOLUME 2, (APPENODICES).
ncil on Environmental Quality, Washington,

rimary bibliographic entry see Field 6G.
11948

OIL AND GAS - AN ENVIRONMENTAL SSMENT. A REPORT TO THE PRE-NT BY THE COUNCIL ON ENVIRONMEN-QUALITY, VOL 5, SIMULATION OF OTHETICAL OFFSHORE PETROLEUM ELOPMENTS.
achusetts Inst. of Tech., Cambridge, Mass.
rimary bibliographic entry see Field 6G.
1953

OIL AND GAS - AN ENVIRONMENTAL SSMENT. A REPORT TO THE PRE-NT BY THE COUNCIL ON ENVIRONMEN-QUALITY, VOL 5, ANALYSIS OF OIL STATISTICS.
chusetts Inst. of Tech., Cambridge, Mass.
imary bibliographic entry see Field 6G.
1954

TIONS BETWEEN PROJECT OMICS AND HYDROLOGICAL DATA,
mic Commission for Europe(UN), New

edimsky.
sign of Water Resources Projects With In-te Data, Vol. 2, Proceedings of the Madrid sium, June 1973; Unesco-WMO-IAHS, 683-696.

tors: *Water resources, *Management, logic data, *Economic impact, *Planning, Design, Hydraulic engineering, Struc-perations, Flood protection, Rivers, Flow, eds(Basins), Water utilization, Water Projects.
ers: *Inadequate data.

ic Commission for Europe (ECE) coun-e experiencing a depletion of natural s due to the accelerating population rate and the economic progress in gical changes. These nations are obliged to improve their water resources management, particularly the accuracy and availability of hydrologic data. This paper appraises the possible economic effect of insufficient hydrological data on the effectiveness of water planning and the design of hydraulic engineering structures and their operation. Considered specifically are: the economic consequences of a deficiency of hydrological data on water planning, construction and operation; and the impact of a deficiency of hydrological data on main water users. These aspects are discussed in terms of following problems: water planning and design; planning and designing of flood protection; the importance of accurate data to show flow formation regarding human activity at watersheds of rivers; domestic and industrial water supply; generation of electric energy by hydro-electric plants and thermal power plants; irrigation; river navigation; fisheries; hydrological forecast for water pollution control programs; sediment control; and data on ice and slush conditions. Insufficient hydrological data and forecasting has considerable impact in all phases of water resources planning and development. (Bell-Cornell)
W76-11970

WATER RESOURCES PLANNING ACT--OVERSIGHT.
For primary bibliographic entry see Field 6E.
W76-11998

COASTAL ZONE MANAGEMENT IN FLORIDA: THE NEED FOR A COMPREHENSIVE PROGRAM,
Spessard L. Holland Law Center, Gainesville, Fla.
For primary bibliographic entry see Field 6E.
W76-12055

REGIONAL WATER QUALITY MANAGEMENT,
SEATAC Inc., Bangkok (Thailand).
For primary bibliographic entry see Field 5G.
W76-12147

SURVEILLANCE IN WATER QUALITY MANAGEMENT,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5G.
W76-12148

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

WATER POLLUTION CONTROL: CROSSROADS OF A MUNICIPAL FINANCIAL DILEMMA,
North Texas State Univ., Denton. Dept. of Administrative Sciences and Marketing.
For primary bibliographic entry see Field 5D.
W76-11626

THE ECONOMIC IMPACT OF CONTROLLING NONPOINT POLLUTION IN HARDWOOD FORESTLAND,
Purdue Univ., Lafayette, Ind. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 5G.
W76-11697

WATER POLLUTION CONTROL ACT OF 1972, REGIONAL IMPACTS, YELLOWSTONE RIVER BASIN.
Stevens, Thompson and Runyan, Inc. Seattle, Wash.
For primary bibliographic entry see Field 5G.
W76-11789

WATER POLLUTION CONTROL ACT OF 1972, ECONOMIC IMPACTS, DAIRY PRODUCTS.
Development Planning and Research Associates, Inc., Manhattan, Kans.
For primary bibliographic entry see Field 5G.
W76-11801

WATER POLLUTION CONTROL ACT OF 1972, ECONOMIC IMPACTS, FOREIGN TRADE,
Public Research Inst., Arlington, Va.
For primary bibliographic entry see Field 5G.
W76-11802

WATER POLLUTION CONTROL ACT OF 1972, ECONOMIC IMPACTS, FRUITS AND VEGETABLES.
Development Planning and Research Associates, Inc., Manhattan, Kans.
For primary bibliographic entry see Field 5G.
W76-11803

WATER POLLUTION CONTROL ACT OF 1972, TECHNOLOGIES AND ECONOMIC IMPACTS, THE FEEDLOT INDUSTRY,
Development Planning and Research Associates, Inc., Manhattan, Kans.
For primary bibliographic entry see Field 5G.
W76-11804

THE ILLUSORY TREASURE OF DAVY JONES' LOCKER,
Southern Connecticut State Coll., New Haven. Dept. of Geography.
For primary bibliographic entry see Field 6E.
W76-11972

DEEPSEA VENTURES: EXCLUSIVE MINING RIGHTS TO THE DEEP SEABED AS A FREEDOM OF THE SEA,
For primary bibliographic entry see Field 6E.
W76-11973

EFFLUENT CHARGES, TOWARDS A NEW ENVIRONMENT,
Spessard L. Holland Law Center, Gainesville, Fla.
For primary bibliographic entry see Field 6E.
W76-12048

6D. Water Demand

ESTIMATING STOCK WATER USE IN RURAL WATER SYSTEMS,
Burns and McDonnell, Kansas City, Mo.
For primary bibliographic entry see Field 3F.
W76-11696

INTERSTATE WATER COMPACTS AND MINERAL DEVELOPMENT,
Loble, Picotte and Pauly, Helena, Mont.
For primary bibliographic entry see Field 3E.
W76-11977

WATERS: NUMBERLESS YET MEAGER,
Spessard L. Holland Law Center, Gainesville, Fla.
For primary bibliographic entry see Field 6E.
W76-12040

6E. Water Law and Institutions

EPA GUIDANCE AND POLICY ON LAND TREATMENT,
Environmental Protection Agency, Washington, D. C. Office of Water Programs.
For primary bibliographic entry see Field 5D.
W76-11638

THE GREAT LAKES AGREEMENT - A MID-TERM PERSPECTIVE,
Department of the Environment, Ottawa (Ontario). Liaison and Coordination Directorate.
For primary bibliographic entry see Field 5G.
W76-11650

THE U. S. ENVIRONMENTAL PROTECTION AGENCY: PAST AND FUTURE CHALLENGES,
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5D.
W76-11658

WATER POLLUTION CONTROL ACT OF 1972, ECONOMIC IMPACTS, MEAT PRODUCTS,
Development Planning and Research Associates, Inc., Manhattan, Kans.
For primary bibliographic entry see Field 5G.
W76-11779

PUBLIC LAW 92-500: TECHNOLOGY ASSESSMENT, TECHNICAL VOLUME.
National Commission on Water Quality, Washington, D.C. Technology Assessment Sector.
For primary bibliographic entry see Field 5G.
W76-11780

ENVIRONMENTAL IMPACT ASSESSMENT, WATER QUALITY ANALYSIS, YADKIN - PEE DEE RIVER BASIN,
TRW, Inc. Redondo Beach, California.
For primary bibliographic entry see Field 5G.
W76-11781

WATER POLLUTION CONTROL ACT OF 1972, ENVIRONMENTAL IMPACT ASSESSMENT, POTOMAC RIVER.
Academy of Natural Sciences, Philadelphia, Pa.
For primary bibliographic entry see Field 5G.
W76-11782

WATER QUALITY ANALYSIS, SNAKE RIVER, IDAHO.
Tetra Tech, Inc., Lafayette, Calif.
For primary bibliographic entry see Field 5G.
W76-11783

WATER POLLUTION CONTROL ACT OF 1972, ENVIRONMENTAL IMPACT ASSESSMENT, SNAKE RIVER.
Parametrix, Inc., Seattle, Wash.
For primary bibliographic entry see Field 5G.
W76-11784

WATER QUALITY ANALYSIS, UPPER RIO GRANDE.
Water Resources Engineers, Inc., Austin, Tex.
For primary bibliographic entry see Field 5G.
W76-11785

WATER POLLUTION CONTROL ACT OF 1972, ENVIRONMENTAL IMPACT ASSESSMENT, IOWA-CEDAR RIVER BASIN.
Midwest Research Inst., Minneapolis, Minn. North Star Research Div.
For primary bibliographic entry see Field 5G.
W76-11786

ENVIRONMENTAL IMPACT ASSESSMENT, WATER QUALITY ANALYSIS, J. PERCY PRIEST RESERVOIR.
Vanderbilt Univ., Nashville, Tenn. Dept. of Environmental and Water Resources Engineering.
For primary bibliographic entry see Field 5G.
W76-11787

ENVIRONMENTAL IMPACT ASSESSMENT, WATER QUALITY ANALYSIS, UTAH LAKE - JORDAN RIVER BASIN.
Environmental Dynamics, Inc., Los Angeles, Calif.
For primary bibliographic entry see Field 5G.
W76-11788

WATER POLLUTION CONTROL ACT OF 1972, REGIONAL IMPACTS, YELLOWSTONE RIVER BASIN.
Stevens, Thompson and Runyan, Inc. Seattle, Wash.
For primary bibliographic entry see Field 5G.
W76-11789

ENVIRONMENTAL IMPACT ASSESSMENT, WATER QUALITY ANALYSIS, LOWER MISSOURI RIVER BASIN.
Midwest Research Inst., Kansas City, Mo.
For primary bibliographic entry see Field 5G.
W76-11790

WATER POLLUTION CONTROL ACT OF 1972, ENVIRONMENTAL IMPACT ASSESSMENT, UPPER MISSISSIPPI RIVER BASIN,
Midwest Research Inst., Minneapolis, Minn. North Star Research Div.
For primary bibliographic entry see Field 5G.
W76-11791

PUBLIC LAW 92-500-- WATER QUALITY ANALYSIS AND ENVIRONMENTAL IMPACT ASSESSMENT, TECHNICAL REPORT (VOLUME I),
National Commission on Water Quality, Washington, D. C. Environmental Sciences Sector.
For primary bibliographic entry see Field 5G.
W76-11806

PUBLIC LAW 92-500--WATER QUALITY ANALYSIS AND ENVIRONMENTAL IMPACT ASSESSMENT, TECHNICAL REPORT, VOLUME II,
National Commission on Water Quality, Washington, D. C. Environmental Sciences Sector.
For primary bibliographic entry see Field 5G.
W76-11807

INTERNATIONAL FIELD YEAR FOR THE GREAT LAKES.
For primary bibliographic entry see Field 2H.
W76-11847

INTERNATIONAL MANAGEMENT OF THE GREAT LAKES-ST. LAWRENCE BASIN,
Western Ontario University, London, Canada, Department of Geography. University of Western Ontario, London. Dept. of Geography.
For primary bibliographic entry see Field 2H.
W76-11887

WISCONSIN STRIVES TO MINIMIZE CONFLICTS OVER THE USE OF WATER,
For primary bibliographic entry see Field 4B.
W76-11896

BOUNDARIES OF SEABED JURISDICTION OFF THE PACIFIC COAST OF ASIA,
N. Ely, and R. F. Pietrowski, Jr.
Natural Resources Lawyer, Vol 8, p 611-629 (1976). 19 p, 43 ref.

Descriptors: *Ownership of beds, *Water resources development, *Foreign countries, *Continental shelf, *Boundary disputes, Oceans, United Nations, Foreign waters, Treaties, Law of the sea, International waters, Mining, Legal aspects, International law, International commissions.
Identifiers: *Geneva Conventions of 1958, *International Court of Justice, *Coastal zone management.

Asian coastal states should have exclusive jurisdiction to license the seabed resources of marginal seas that they enclose, without regard to depth or distance. This right is supported by the International Court of Justice's North Sea decision, which said that undersea areas can be and often are submarine prolongations of land territories. Principles which should determine boundaries between these states are listed and explained. Specific geographical features, such as the Yellow Sea, the East China Sea, the South China Sea and the Gulf of Thailand are the subjects of seabed boundary evaluations. (Frank-Florida)
W76-11897

REQUIRING POLLUTERS TO PAY FOR AQUATIC NATURAL RESOURCES DESTROYED BY OIL POLLUTION,
Office of the Judge Advocate General (Navy), Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-11898

APPROPRIATION BY THE STATE OF MINIMUM FLOWS IN NEW MEXICO STREAMS,
For primary bibliographic entry see Field 4A.
W76-11899

MINIMUM STREAMFLOW-FEDERAL POWER TO SECURE,
For primary bibliographic entry see Field 4A.
W76-11900

PROPERTY RIGHTS IN THE WORLD OCEAN,
Resources for the Future, Inc., Washington, D.C.
F. T. Christy, Jr.
Natural Resources Journal, Vol 15, p 695-71 (October 1975). 18 p, 15 ref.

Descriptors: *Mining, *Continental shelf, *Ownership of beds, *United Nations, *Law of the sea, *Water resources development, Economics, Economic feasibility, Economic efficiency, Manganese, Mineral industry, International law, International waters, Oceans, Legislation, Federal jurisdiction, Jurisdiction.
Identifiers: *Coastal waters.

In the past, the cost to coastal nations of keeping an ocean area exclusive was greater than the potential benefits to be derived. This assessment in doubt today as nations are on the verge of ocean resource mining. Costs and benefits are unknown. Thus, property rights are also in flux as nations are attempting to base their legal rights on economic factors. Alternative schemes include an enterprise system, a licensing system, and unilateral protection of national entrepreneurs. Consequences of these plans are discussed, as well as the likelihood of implementation. Considerable economic waste exists today from the common property condition but it is unknown whether political pressures for unilateral sovereignty are justified. The United Nations Conference on the Law of the Sea, as well as further research, will hopefully provide some of the answers, both political and economic. (Frank-Florida)
W76-11901

INDIAN TREATY ANALYSIS AND OFF-RESERVATION FISHING RIGHTS: A CASE STUDY,
R. A. Finnigan.
Washington Law Review, Vol 51, p 61-95 (197 35 p, 177 ref.

Descriptors: *Treaties, *Indian reservation, *Fishing, *Judicial decisions, *Legal aspects, Fish, Fish farming, Legal review, State gover

ents, State jurisdiction, Rivers, Streams, Water
v, Federal reservations.

recent federal district court decision, U. S. v.
ashington, held that certain treaties in the
rthwest gave Indians the opportunity to harvest
% of the salmon and steelhead run. The decision
examined here in light of the history of fishing
hts in the area, as well as the evolution of state
ulation of off-reservation indian treaty fishing.
e treaty was held to be not a grant of rights to
Indians, but a grant of fishing rights from
m, with all rights not granted reserved to the In-
ns. Taking of fish on off-reservation land
nted by treaty, although previously regulated
the state, must be excluded from such regula-
. However, treaty limits grant the Indians only
qual share of fishing rights in conjunction with
-Indians in the areas designated. (Frank-
rida)
6-11902

RRIS-GALVESTON SUBSIDENCE DISTRICT
EATED TO 'END' SUBSIDENCE,
ris-Galveston Coastal Subsidence District,
ston, Tex.
primary bibliographic entry see Field 4B.
-11919

THOD OF CONTROL OF LAND AND
TER USES IN THE COASTAL ZONE,
rge Washington Univ., Washington, D. C.
. Berger.
lable from the National Technical Informa-
Service, Springfield, Va 22161, as PB-249 799,
in paper copy, $3.00 in microfiche. George
ington University Master's thesis; prepared
OAA Office of Coastal Zone Management,
ber 1975. 44 p, 6 tab, 24 ref.

riptors: *Resources development,
agement, *Coasts, Water resources, *Land
Governments, Federal government, Local
nments, State governments, Planning, Water
tion.
fiers: *Coastal Zone management.

methods of control of land and water uses in
astal zone' of the Coastal Zone Management
f 1972 are examined. Three methods deter-
the manner in which the state's coastal zone
gement program will be implemented. They
ocal regulation according to state guidelines;
state regulation; and state administrative
of plans for consistency with state manage-
program. This paper describes the derivation
three models from past experience in
ce management at the Federal and state
and identifies and analyzes the potential ad-
es for each method. Next, it documents a
which indicates that more states are con-
g using the first method alone or in com-
n with either the second or third methods.
, it concludes that the most efficious pro-
would consist of a mix between the first and
methods. In the resulting 'suggested
l' the state would directly regulate regional
while there would be local government
g and regulation for all other uses. (Sinha-
922

IL AND GAS - AN ENVIRONMENTAL
SMENT. A REPORT TO THE PRE-
T BY THE COUNCIL ON ENVIRONMEN-
UALITY, VOLUME 2, (APPENODICES).
on Environmental Quality, Washington,

nary bibliographic entry see Field 6G.
948

LUSORY TREASURE OF DAVY JONES'
R,
n Connecticut State Coll., New Haven.
Geography.

M. I. Glassner.
San Diego Law Review, Vol 13, p 533-551 (1976). 19 p, 49 ref.

Descriptors: *Continental shelf, *Mining, *Manganese, *Economics, *United Nations, Continental slope, Continental margin, Cost-benefit analysis, Feasibility, International law, International waters, United States, Mining engineering, Exploration, Water resources development, Foreign countries.
Identifiers: Coastal zone management, Coastal waters.

With seabed mineral mining about to undergo substantial expansion, nationalism has intruded by presenting an increase in the number of extended coastal economic zones. Related problems include responsibility for water pollution and for new methods of technology. Coastal nations are extending their zones to the limits of the continental shelf, with the result that land-locked nations seem to be losing any chance for sharing in seabed resources. The author proposes that such interests be protected under the proposed United Nations Charter of Economic Rights and Duties of States. Under a new seabed authority, coastal nations would donate an agreed percentage of mineral values, including hydrocarbon proceeds. Assistance in technology and development could also be granted. This trend is slow in coming, however, and the current energy squeeze makes cooperation more unlikely. Manganese nodule mining seems to be the most economical subject for such cooperation. (Frank-Florida)
W76-11972

DEEPSEA VENTURES: EXCLUSIVE MINING RIGHTS TO THE DEEP SEABED AS A FREEDOM OF THE SEA,
J. G. Jackson.
Baylor Law Review, Vol 28, p 170-186 (Winter 1976). 17 p, 67 ref.

Descriptors: *Mining, *Law of the sea, *International law, *United States, *Manganese, Economics, International waters, Exploration, Continental shelf, Development, Legal aspects, Conferences, United Nations, Feasibility, Coasts, Foreign countries.
Identifiers: Coastal waters.

Examined here is whether exclusive rights to seabed resources have legal precedent in the law governing the surface of the high seas. Deepsea Ventures Inc., a United States company, claimed exclusive rights to seabed manganese nodules in the northern Pacific Ocean. The basis of this claim was extensive, resting on international conventions, international custom and generalized principles of law. Concern arose over the United States' reluctance to claim outright the seabed for itself and, therefore, over who would ultimately be responsible for any damages that might result from the mining. The author urges that the company be denied its exclusive rights due to the probable retaliation of other coastal states. The Law of the Sea should not be governed by gunboat diplomacy. (Frank-Florida)
W76-11973

WATER ALLOCATION IN UTAH--PROTECTION OF INSTREAM USES,
For primary bibliographic entry see Field 4A.
W76-11974

COMPENSATION FOR OIL POLLUTION AT SEA: AN INSURANCE APPROACH,
San Diego Univ., Calif. School of Law.
For primary bibliographic entry see Field 5G.
W76-11975

WETLAND'S RELUCTANT CHAMPION: THE CORPS TAKES A FRESH LOOK AT 'NAVIGABLE WATERS',
Lewis and Clark Coll., Portland, Oreg. Northwestern School of Law.
For primary bibliographic entry see Field 4A.
W76-11976

INTERSTATE WATER COMPACTS AND MINERAL DEVELOPMENT,
Loble, Picotte and Pauly, Helena, Mont.
For primary bibliographic entry see Field 3E.
W76-11977

ADJUDICATION OF INDIAN AND FEDERAL WATER RIGHTS IN THE FEDERAL COURTS: UNITED STATES V AKIN.
University of Colorado Law Review, Vol 46, No 4, p 555-85 (1975). 31 p.

Descriptors: *Indian reservations, *Federal reservations, *Federal-state water rights conflicts, *Federal jurisdication, Reservation doctrine, State jurisdiction, Water rights, Colorado, Judicial decisions, National parks, National historic sites, National recreation areas.
Identifiers: *McCarran Amendment.

A recent federal appellate decision allows federal court jurisdiction over water rights adjudications when the United States asserts proprietary interests as plaintiff. Examined here is the relationship of the McCarran Amendment to federal jurisdiction. The amendment removes federal sovereign immunity in water adjudications. The author concludes that the federal courts should not rely on the abstention doctrine when state questions cannot dispose of constitutional issues. Furthermore, limited federal jurisdiction is preferred to prevent undue interference with state institutions and for protection of legitimate state interests. When the United States files as plaintiff for determination of federal rights the choice of federal forum should be seriously considered but priority of suit may not always be an appropriate determination when an ongoing state procedure is present. With regard to determination of Indian water rights the author determines that state courts are without jurisdiction. (Comer-Florida)
W76-11978

ENVIRONMENTAL LAW--STATUTORY INTERPRETATION--THE ENVIRONMENTAL PROTECTION AGENCY ENTERS THE NUCLEAR AGE--COLORADO PUBLIC INTEREST RESEARCH GROUP, INC V TRAINS 507 F2D 743 (10TH CIR 1974),
For primary bibliographic entry see Field 5G.
W76-11979

PROBLEMS OF GROUNDWATER RIGHTS IN OHIO,
Akron Univ., Ohio. School of Law.
For primary bibliographic entry see Field 4B.
W76-11980

NITRATE POLLUTION AND THE CALIFORNIA ENVIRONMENTAL QUALITY ACT: THE APPROPRIATE SOLUTION TO A NEGLECTED PROBLEM,
For primary bibliographic entry see Field 5G.
W76-11981

PROTECTION OF THE MARINE ENVIRONMENT,
National Petroleum Council, Washington, D. C. Committee on Ocean Petroleum Resources.
For primary bibliographic entry see Field 5G.
W76-11982

THE SETTLEMENT OF INTERNATIONAL ENVIRONMENTAL DISPUTES,
Wisconsin Univ., Madison. School of Law.
R. B. Bilder.
University of Wisconsin Sea Grant College Program, Technical Report 231, University of Wisconsin (February 1976). 92 p.

Descriptors: *Foreign countries, *International law, *Law of the sea, *Jurisdiction, *Environmental control, Economics, Air pollution, Water pollution, Water policy, Political aspects, Legal aspects, Environmental engineering, Environmental sanitation, Economic impact, Exploitation, Governments, International commission, Water resources development.

International environmental concern is a phenomenon of the past decade. It is a rapidly growing, complex, and poorly defined field with a great amount of potential, as well as controversy, in specific areas. This monograph presents five lectures dealing with disputes arising and methods of settlement in the international environmental sphere. The lectures focus on disputes concerning international rivers and lakes, marine environment, air pollution, and on new frontiers such as outerspace and nuclear testing. Each lecture presents an overview of relevant law relating to the area discussed and then analyses actual disputes and their solution. Some actual problems treated are the Colorado River salinity dispute, the Lake Lanoux dispute, the Finnish arsenic dumping incident, the recent Law of the Sea Conference, the Ozone problem, Scandanavia's 'acid rain', and the St. Clair River problem. The concluding lecture presents some principles of international law related to the environmental problem. Recognition of international responsibility, flexibility in problem solving, development of knowledge and avoidance of disputes are some of the principles explored. (Comer-Florida)
W76-11983

U. S. DEFINES POSITION ON 200-MILE ECONOMIC ZONE AT CONFERENCE ON THE LAW OF THE SEA,
Rhode Island Univ., Kingston. Law of the Sea Inst.
J. R. Stevenson.
Department of State Bulletin, Vol. 71, p. 232-236, August 5, 1974. 5 p.

Descriptors: *United Nations, *Law of the sea, *Boundary disputes, *Jurisdiction, *Treaties, Navigation, Straits, Navigable waters, Ownership of beds, Bodies of water, Oceans, Legal aspects, Political aspects, International law, Foreign waters, International waters, Foreign trade, Commercial fishing, Administration, Regulation, Pollution, Research, United States.
Identifiers: *Territorial sea, *Economic zone.

The U. S. Special Representative to the Third U. N. Conference on the Law of the Sea at Caracas addressed the Conference on July 11 and present his views on the objectives and accomplishments of the Conference. He noted the growing consensus for extending the twelve mile outer limit for territorial sea jurisdiction and for establishing two hundred mile outer limit for coastal state economic zones. He also addressed the issues of free transit through international straits and of non-discriminatory access to the resources of the seabed under the overviw of an international authority. Finally, he stated that the minimum objectives of the Caracas Session should be to complete treaty texts on: (1) the limits of the territorial seas and economic zones; (2) the formation of an international authority; (3) control of the seabed; and (4) measures for pollution control and scientific research. (Hadoulias-Florida)
W76-11984

OIL, SUPER-SHIPS AND THE OCEANS,
For primary bibliographic entry see Field 5G.
W76-11985

THE INTRACOASTAL WATERWAY: AN ECOLOGICAL PERSPECTIVE,
Florida Atlantic Univ., Boca Raton Dept of Biological Sciences.
For primary bibliographic entry see Field 5G
W76-11986

SPECIAL DISTRICTS--CREATION OF WATER MANAGEMENT DISTRICT PURSUANT TO GENERAL LAW IN A CHARTER COUNTY.
Florida Office of the Attorney General, Tallahassee. Dept. of Legal Affairs.
Op Att'y Gen Fla 075-108 (1975). 4 p.

Descriptors: *Local governments, *Florida, *Governmental interrelations, *Water districts, *Adoption of practices, State governments, Legislation, Legal aspects, Political aspects, Institutional constraints, Institutions, Planning, Regulation, Water law, Water policy, Administration, Management, Comprehensive planning, Control.

The Florida Attorney General was asked whether a special water management district could be established in Broward County, Florida, pursuant to Chapter 298 of the Florida Statutes in view of the recently enacted Broward County charter and of Chapter 165 of the statutues. He answered in the negative after tracing the legislative history of the chapters in question and analyzing a Florida District Court of Appeal case. Such districts may be established only in accordance with the provisions of Chapter 74-192, Laws of Florida. The Attorney General also analyzed the levying of ad valorem taxes by water management districts. (Reinders-Florida)
W76-11988

COMPREHENSIVE OIL POLLUTION LIABILITY AND COMPENSATION ACT OF 1975.
For primary bibliographic entry see Field 5G.
W76-11990

REVIEW OF PROJECTS AFFECTING SOLE SOURCE AQUIFERS, EDWARDS UNDERGROUND RESERVOIR, TEXAS AREA; INTERIM PROJECT REVIEW GUIDELINES.
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-11991

INORGANIC CHEMICALS MANUFACTURING POINT SOURCE CATEGORY.
Environmental Protection Agency.Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-11992

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM: SEPARATE STORM SEWERS.
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-11993

OFFSHORE SEGMENT OF THE OIL AND GAS EXTRACTION POINT SOURCE CATEGORY.
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-11994

ALASKA NATIONAL INTEREST LANDS.
Hearings—Comm on Interior and Insular Affairs, US Senate, Nov 21, Dec 11, 1975, p 1-272.

Descriptors: *Alaska, *Legislation, *Federal government, *National parks, *Wild rivers, National recreation areas, Federal jurisdiction, Rivers, Streams, Lakes, Legal aspects, Ecology, Environment, Water resources, Water sources, Water resources development
Identifiers: *Congressional hearings

Hearings were held on three bills, S 1687, S 1688 and S 2676, which would implement the Alaska Native Claims Settlement Act. Approximately 270 million acres are potentially designated for inclusion in five national conservation systems: the National Forest, Park Wild and Scenic Rivers, and Wildlife Refuge Systems, as well as a new Scenic Reserve System. Statements were entered in the record in support of the bills and contained explanations of the practical effects of the legislation. Rivers, streams and lakes to be included are specifically delineated, as well as fishing areas. (Frank-Florida)
W76-11995

MARINE MAMMAL PROTECTION OVERSIGHT.
Hearings---Sub Comm on Fisheries and Wildlife Conservation and the Environment—Comm on Merchant Marine and Fisheries, US House of Representatives, Oct 21, 29, 30, Dec 9, 1975, p 1-325.

Descriptors: *Conservation, *Marine fish, *Mammals, *Marine animals, *Fish conservation, Fishing, Fish farming, Fish populations, Protection, Aquatic life, Commercial fish, Permits, Legal aspects, Treaties, Oceans.

Oversight hearings have been held concerning the implementation of the Marine Mammal Protection Act. The relationship between purpoise conservation and tuna fishing practices was discussed on both the national and international levels. The participation of states in marine mammal management, as well as legal processes involved in their protection were also examined. The committee gave close scrutiny to the killing of seals and the fur trade, including both numbers killed and methods of killing. Members of the committee urged stronger penalties for indiscriminate or brutal seal killing. Finally, treaty obligations pertaining to tuna and seal-harvesting were discussed. (Frank-Florida)
W76-11996

LAND AND WATER RESOURCE CONSERVATION ACT OF 1976.
S Rep No 94-895, 94th Cong, 2d Sess 1-14 (1976) 14 p.

Descriptors: *Planning, *Federal government, *Legislation, *Long-term planning, *Water resources development, Comprehensive planning, Natural resources, Political aspects, Decision making, Resource development, Water law, Water quality, Water policy, Land resources, Protection, Economics, Governments, Conservation, Soil conservation, Water conservation, Regulation.
Identifiers: Congressional hearings.

The Committee on Agriculture and Forestry submitted this report on S.2081, a bill to provide for furthering the conservation, protection, and enhancement of the Nation's land, water, and related resources for sustained use, and for other purposes. The Committee reports favorably thereon with an amendment and recommends passage of the bill. S.2081 would establish a mechanism for making long-range policy to encourage the wise and orderly development of the Nation's soil and water resources. Included with the report are: a short explanation of the provisions of the bill and the relevant factors to be considered in determining long-range policy; a discussion on the background and need for the legislation; a section-by-section analysis of the bill; and an estimate of the costs that would be incurred by the Federal Government as a result of enactment for the years 1977-1982. There is also an appen-

elineating the responsibilities and programs of ne Soil Conservation Service, an agency of the Department of Agriculture. (Reinders-Florida)
V76-11997

VATER RESOURCES PLANNING ACT--OVER-IGHT.
earings---Sub Comm on Energy Research and Vater Resources---Comm on Interior and Insular ffairs, US Senate, Oct 16, 1975, p 1-230.

escriptors: *Columbia River, *Legislation, Planning, *River basin commissions, *Water esources Planning Act, Water resources, State vernments, Federal government, Financing, olumbia River, Water Resources Research Act, ater resource development, Administration, In-rstate commissions, Project purposes, Regional velopment.
entifiers: *Congressional hearings.

earings have been held to find better ways to ex-d the Water Resources Planning Act (WRPA) in 76. Presented at these hearings were the views various states on issues such as the need for re federal funding and greater autonomy for er basin commissions. The states also requested ater representation on the Water Resources uncil (WRC), and the establishment of a re-nalized structure within it. Basically, the States nted expansion of the WRC in order to create a re cohesive national water resource policy. Ex-sion of Title III of the WRPA was suggested as eans of achieving greater effectiveness. As to e II, dealing with the River Basins Commis-, the majority of states felt that the Federal vernment should plan through it rather than ugh other agencies. This was especially true in rd to the Columbia River Basin. (Frank-rida)
5-11998

TIONAL OCEANIC AND ATMOSPHERIC MINISTRATION -- OVERSIGHT HEARINGS.
rings --- Sub Comm. on the Environment and Atmosphere --- Comm. on Science and Tech., House of Representatives, July 16-18, 22-25, , p. 1-488.

criptors: *Fish conservation, *Water pollution rol, *Environmental effects, *Weather fication, Water pollution sources, North rica, Environments, Floods, Thunderstorms, ng, Oceans, Oceanography, Sea ice, Seed ment, Sea water, Snow, Snowfall, Snowmelt.

purpose of the hearings was to acquaint the nittee members with the work of the National nic and Atmospheric Administration AA) over the past years. Witnesses testified NOAA's work in weather control, including -seeding to produce rain, and thunderstorm vation and prediction. Weather projects in-snow-melt observation stations and hur-prediction flights. Witnesses were also as to NOAA's water pollution studies off st and west coasts, including fish poisoning ts and proposals for pollution control. Also nted were reports covering a wide range of nmental issues, including oil pollution from and effects of all types of pollution on fish sh management. (Frank-Florida)
1999

ER MANAGEMENT DURING DROUGHT TS,
l and Southern Florida Flood Control Dis-Vest Palm Beach.
imary bibliographic entry see Field 4A.
2000

CLE--REUSE, INFALL--OUTFALL, DECI-CONFRONT SCIENCE, PUBLIC,
l and Southern Florida Flood Control Dis-Vest Palm Beach.

For primary bibliographic entry see Field 5D.
W76-12001

MANAGING SOUTH FLORIDA'S GROUND-WATER AQUIFER,
Central and Southern Florida Control District, West Palm Beach.
For primary bibliographic entry see Field 4B.
W76-12002

EXAMINATION OF WATER MANAGEMENT ALTERNATIVES IN CONSERVATION AREA 2A.
Central and Southern Florida Flood Control District, West Palm Beach.
For primary bibliographic entry see Field 4A.
W76-12003

LAW OF THE SEA: A STATE MUST EXERCISE SUBSTANTIAL CONTINUOUS AND RECOGNIZED AUTHORITY TO ESTABLISH A BODY OF WATER AS A HISTORIC BAY,
S. M. Stebbins.
Georgia Journal of International and Comparative Law, Vol 6, p 309-322 (1976). 14 p, 116 ref.

Descriptors: *Jurisdiction, *Continental shelf, *Bays, *Law of the sea, *Submerged Lands Act, Legal aspects, Legal review, Judicial decisions, Oil wells, State governments, Federal government, State jurisdiction, Federal jurisdiction, Legislation, Continental margin, Mineral industry.
Identifiers: *Coastal zone management.

Recent developments in water law indicate problems in deciding whether a state or the federal government has title to offshore oil deposits. The Submerged Lands Act granted inland water rights to the states; but the precise definition of offshore boundaries has yet to be made by Congress. The Supreme Court in a 1975 decision, U.S. v. Alaska, ruled that a state claiming land as an historic bay must show the exercise of substantial, continuous and recognized authority over that water. Alaska did not meet this burden, and the federal government retained title to the offshore rights. Exactly how much land belongs to the states and how much to the federal government is still unsettled. (Frank-Florida)
W76-12004

SETTLEMENT OF DISPUTES UNDER THE LAW OF OCEAN USE, WITH PARTICULAR REFERENCE TO ENVIRONMENTAL PROTECTION,
American Society of International Law, Washington, D.C.
J. L. Hargrove.
Georgia Journal of International and Comparative Law, Vol 6, p 181-196 (1976). 16 p, 36 ref.

Descriptors: *Treaties, *Water resources development, *Law of the sea, *United Nations, *International commissions, Water law, Legal aspects, Water rights, Legislation, Water policy, Governments, Judicial decisions, Legal review, International waters.

Examined here are formal procedures that will come into effect for the resolution of ocean disputes following a new, comprehensive law of the sea treaty. Expert committees will handle special classes of disputes, such as those concerning fisheries, pollution and scientific research. Where there are no special procedures, conciliation rules will be applicable. Where other disputes arise, binding decisions could be given by an arbitration tribunal, the Law of the Sea Tribunal, or any combination of the three. Substantive rules of great precision are required. Finally, resolution of environmental disputes will be left largely to the separate nations; thus, regulation of environmental activities will be kept to a minimum. (Frank-Florida)
W76-12005

AN INTERNATIONAL REGIME FOR THE SEABED BEYOND NATIONAL JURISDICTION,
Carnegie Endowment for International Peace, New York. International Law Program.
T. M. Franck.
Georgia Journal of International and Comparative Law, Vol 6, p 151-179 (1976). 29 p, 158 ref.

Descriptors: *United Nations, *International agreement, *Law of the sea, *Mining, *Economics, Legal aspects, Water law, Oceans, International commissions, Federal government, Foreign waters, Treaties, Manganese, United States, Water resources development.
Identifiers: *Third United Nations Conference on Law of the Sea.

The Third United Nations Conference on the Law of the Sea is presently working on establishing offshore limits for national economic zones. Several sets of limits are discussed, with benefits accruing to each. In all, however, the U.S., U.S.S.R., Canada, Australia and Indonesia will benefit the most. The system pushed presently by poor countries will result in a still greater discrepancy between rich and poor countries. Originally, more equitable proposals were advanced, but short-sighted poor nations demanded enlarged economic zones. Finally, the problems of any potential International Seabed Authority are listed. (Frank-Florida)
W76-12006

SOME BIOLOGICAL BACKGROUND FOR INTERNATIONAL LEGAL ACTS ON RATIONAL UTILIZATION OF THE LIVING RESOURCES OF THE WORLD OCEAN,
All-Union Research Inst. of Marine Fisheries and Oceanography; Moscow (USSR)
P. A. Moiseev.
Georgia Journal of International and Comparative Law, Vol 6, p 143-149 (1976). 7 p.

Descriptors: *Continental shelf, *Fishing, *United Nations, *International law, *Biology, *Food chains, Oceans, Food abundance, Food pyramids, Fish management, Fish harvest, Fish conservation, Fish, International waters, Marine fish, Marine fisheries, International commissions.

Present plans to maintain 200-mile coastal zones for fishing ignore the realities of ocean biology. Examined here is a system which would encourage the development of national fisheries. Since the vast majority of the world catch is in these waters, it would also encourage greater efficiency. While this system may function well both politically and militarily, it does not function well biologically. An increased efficiency of fish catch would disrupt, possibly forever, the possibility of sufficient future stocks. As of now, this fundamental fact is being ignored. (Frank-Florida)
W76-12007

INTERNATIONAL FISHERIES MANAGEMENT WITHOUT GLOBAL AGREEMENT: UNITED STATES POLICIES AND THEIR IMPACT ON THE SOVIET UNION,
Louisiana State Univ. Law Center, Baton Rouge.
H. G. Knight.
Georgia Journal of International and Comparative Law, Vol 6 p 119-142 (1976). 24 p, 97 ref.

Descriptors: *Jurisdiction, *International law, *Fisheries, *Fish management, *Treaties, Federal government, Legal aspects, Legislation, Oceans, Continental shelf, Economics, Permits, Fishing, Marine fish, Foreign countries.
Identifiers: *Coastal zone management.

The U.S. will adopt a 200-mile exclusive fishing zone in 1976 by way of the Magnuson bill. This will give the U.S. a superior bargaining position over the Soviet Union in the area of coastal fisheries exploitation. Other countries may make broad exclusive fishing zone claims, broad preferential

fishing zone claims, anadromous species claims, and multilateral and bilateral arrangements to take care of their fishing rights. Major facets of U.S. fishery policy are reviewed from 1954 to the present. Under the Magnuson bill, foreign nations will have to pay fishing rights fees set by the Secretary of Commerce. (Frank-Florida)
W76-12008

THE FREEDOM OF NAVIGATION UNDER INTERNATIONAL LAW,
London Univ. (England).
W. E. Butler.
Georgia Journal of International and Comparative Law, Vol 6, p 107-118 (1976). 12 p, 29 ref.

Descriptors: *International law, *Law of the sea, *Legal aspects, *Oceans, *Navigation, Negotiations, United Nations, Commercial fishing, Foreign waters, Foreign trade, Treaties, International waters, Boundaries(Surfaces), Boundary disputes.
Identifiers: *Coastal waters.

An informal negotiating text has emerged from the Geneva session of the Third U.N. Conference on the Law of the Sea. It still must be modified but tangible benefits can be expected from any draft treaty that follows. Should the Conference fail, however, to produce any revision of the law of the sea, it is possible that national demands for coastal water rights will be heard. Jurisdictional conflicts will then erupt as coastal states claim convergent economic and territorial rights. Navigation laws, in effect for centuries, could be disrupted as more and more of the ocean is claimed. Thus there is much riding on the Conference, as national pressures increase behind the scenes. (Frank-Florida)
W76-12009

THE FREEDOM OF NAVIGATION AND THE PROBLEM OF POLLUTION OF THE MARINE ENVIRONMENT,
Gosudarstvennyi Proektno-Izyskatelskii i Nauchno-Issledovatelskii Institut Morskogo Transporta 'Soyuzmorniiproekt', Moscow (USSR).
For primary bibliographic entry see Field 5G.
W76-12010

LIABILITY FOR MARINE ENVIRONMENT POLLUTION DAMAGE IN CONTEMPORARY INTERNATIONAL SEA LAW,
Gosudarstvennyi Proektno-Izyskatelskii i Nauchno-Issledovatelskii Institut Morskogo Transporta 'Soyuzmorniiproekt', Moscow (USSR).
For primary bibliographic entry see Field 5G.
W76-12011

RESPONSIBILITY AND LIABILITY FOR HARM TO THE MARINE ENVIRONMENT,
International Inst. for Environment and Development, Washington, D.C. North American Office.
For primary bibliographic entry see Field 5G.
W76-12012

FREEDOM OF SCIENTIFIC RESEARCH IN THE WORLD OCEAN,
Akademiya Nauk URSR, Kiev. Inst. of State and Law.
A. F. Vysotsky.
Georgia Journal of International and Comparative law, Vol 6, p 7-25 (1976). 19 p, 33 ref.

Descriptors: *International waters, *Research and development, *International law, *Oceans, *Legal aspects, International commissions, Foreign waters, Treaties, United Nations, Law of the sea, Research priorities, Water resources development, Projects, Testing, Planning.
Identifiers: *Ocean research.

Freedom of scientific research in international waters has never been fully accepted by the international community. With the coming of new national economic zone boundaries, there is a possibility that research will have limits imposed on both inside and outside these zones. A proposal exists now to grant an international authority the exclusive right to engage in scientific research. These possibilities are detrimental to the better use, understanding and research of the 'World Ocean', and should be rejected in favor of total research freedom. (Frank-Florida)
W76-12013

ZERO DISCHARGE: NATIONAL GOAL OR NATIONAL CALAMITY,
Allied Chemical Corp., New York.
For primary bibliographic entry see Field 5G.
W76-12014

THE ROLE OF NORTH AMERICAN DEEP WATER PORTS,
For primary bibliographic entry see Field 5G.
W76-12015

SALT MARSHES-ECOSYSTEMS IN DANGER,
Cape Cod Museum of Natural History, Brewster, Mass.
For primary bibliographic entry see Field 5G.
W76-12016

SUPERPORTS: THE NEED IS COMING,
Federal Maritime Commission, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-12017

HOW MODERN TECHNOLOGY IS ENDANGERING OUR LIVES: OCEAN POLLUTION,
For primary bibliographic entry see Field 5G.
W76-12018

PREPARING TO TAKE THE PLUNGE (ATLANTIC OFFSHORE OIL),
For primary bibliographic entry see Field 5G.
W76-12019

THE BATTLE OF LAKE SUPERIOR: RESERVE MINING'S BIG SEWER,
For primary bibliographic entry see Field 5G.
W76-12020

THE RICHES IN DAVY JONES'S LOCKER (1974 INTERNATIONAL LAW OF THE SEA CONFERENCE).
Newsweek, Vol 83, p 66-68, June 24, 1974. 3 p, 1 map, 2 photo.

Descriptors: *Foreign waters, *Law of the sea, *Oceans, *Treaties, *Exploitation, Fishing, Mining, International law, International waters, Pacific Ocean, Fish, Natural resources, Leases, Straits, Foreign trade, Coasts, Shores, Oil industry, Governments, Legal aspects, Manganese.
Identifiers: Off-shore oil drilling.

The International Law of the Sea Conference was convened to develop a treaty spelling out the economic and legal rights of all nations in the seas. A previous conference had given coastal nations the right to exploit their off-shore resources to a depth of 600 feet or deeper if technologically feasible. With the development of better equipment for dredging, a nation could claim resources hundreds of miles offshore. Two basic areas of agreement have been reached at the present conference. The first is to extend the territorial rights of a coastal nation to 12 miles out from the shore, while guaranteeing that the straits now treated as high seas would remain open to all ships. The second is to give coastal countries control over underwater resources within 200 miles of their shores thus requiring foreign corporations to negotiate rights to fish or mine within those areas. The major issue at the conference is how the area beyond the 200-mile limit will be mined. One suggestion is that a central sea-bed authority lease to multinational corporations who would then operate freely. The other is that all exploitation be closely controlled by a multigovernmental corporation. (Capehart-Florida)
W76-12021

THE UNTAPPED UNDERGROUND SEA OF PURE WATER,
For primary bibliographic entry see Field 4B.
W76-12022

THE WORLD'S LARGEST WATER PROJECT,
For primary bibliographic entry see Field 4A.
W76-12023

SQUEEZING MORE OUT OF THE SEAS.
Time, Vol. 104, p. 54-58, July 29, 1974. 5 p, 7 photo.

Descriptors: *Manganese, *Mining, *Beds under water, *Aquiculture, *International commissions, Oceans, Operations research, On-site tests, On-site laboratories, Seas, Exploration, Foreign research, Projects, Research equipment, Research facilities, Resources development, Technology, Testing, Metals, Oil, Mining engineering, Energy, Heat, Fisheries, Fish farming.

Marine scientists from many countries are busy sampling, probing and testing the seas and the seabed. Russian and American marine scientists working together in a joint marine research program called Norpax have discovered new facts in water currents and global tectonics. In addition they have discovered and charted the location of seabed manganese nodule deposits. Mining of these new manganese nodule deposits is being actively pursued by many corporations and nations. In addition, ocean sources of gas and promising oil sites in the deep oceans have been located. Scientists are also looking to harvest thermal currents in the oceans as another energy source. The article concludes with an examination of recent developments in aquiculture where emphasis is being placed upon harvesting plankton, and encouraging people to try eating some of the 30,000 to 40,000 underutilized fish varieties. (Hadoulias-Florida)
W76-12024

OCEANS, TECHNOLOGY AND LAW.
Akademiya Nauk SSSR, Moscow. Inst. of State and Law.
Moscow: Yuridicheskaya Literatura, 1972. 229 p. (Translation from Russian for NOAA National Marine Fisheries Service, Washington, D.C., Office of International Fisheries).

Descriptors: *Foreign countries, *Water resource development, *International waters, *Law of the sea, *International law, Legislation, Treaties, Technology, Sea water, Oceans, Political aspects, Legal aspects, Straits, Mining, Military aspects, Continental shelf.
Identifiers: *USSR.

This book examines the role of international law in regulating the exploitation and use of the world's oceans. Problem areas include: the territorial sea; straits; canals; Continental Shelf and seabed; fisheries; and the conservation of living resources. If mankind is fully to utilize technology for peaceful purposes, there must be rational development of methods to regulate exploitation of living and mineral resources in international waters. (See W76-12026 thru W76-12036) (Hadoulias-Florida)
W76-12025

ROBLEMS IN THE USE OF INTERNATIONAL TRAITS,
SSR Academy of Sciences, Moscow, Institute of ate and Law.
D. Barabolya.
: Oceans, Technology and Law, Chapter I, p 3- , Moscow, USSR Academy of Sciences, 1972.

escriptors: *Military aspects, *Ships, *Straits, nternational waters, *Law of the sea, Naviga- n, Jurisdiction, Political aspects, Law enforce- ent, Treaties, Foreign countries, Continental elf.
entifiers: Historic straits, International straits, chipelagic straits, Innocent passage.

is chapter examines Soviet proposals for a legal ime calling for freedom of navigation through jor international straits and international tes, as well as for the prohibitions of military neuvers in such areas. Straits are classified into following legal categories: strait leading to the rnal seas or bays of coastal states; 'historic' its located on the outskirts of basic interna- al routes which have economic and defense ificance for a coastal state; archipelagic its, specifically the Indonesian Archipelago, ch permit 'innocent passage'; straits leading to ed seas of major importance to a small group coastal states; and 'international straits' con- ting the high seas and serving as world routes. ximum territorial sea width in straits is cur- ly three miles; however, unilateral extentions mits suggest an acceptable new maximum of ve miles provided a two or three mile 'center e' is established as part of the 'high seas'. stal state jurisdiction and criminal jurisdiction also be limited so that ships will enjoy full im- ity from detainment and arrests while in sit. (See also W76-12025) (Hadoulias-Florida) -12026

LEGAL SETTING OF INTERNATIONAL ALS,
R Academy of Science, Moscow, Institute of and Law.
Efendiev.
ceans, Technology and Law, Chapter 2, p 34- loscow, USSR Academyof Sciences, 1972.

riptors: *Canal zone, *Straits, *Military ts, *Law of the sea, *International law, gation, Political aspects, Law enforcement, ies, *Canals, Inland waterways, Artificial courses, Foreign countries, International s.
ifiers: *Kiel Canal, *Suez Canal, Territorial and, Freedom of navigation, *International s.

oviet Union believes that the Suez, Kiel, and na Canals are of such international im- nce in connecting high seas basins and serv- artificial waterways to closed seas as to call inciples of freedom of navigation. However, spect must also be given to the sovereignty states through whose territory the water- passes. User states must refrain from inter- in such country's internal political and inter- al affairs. The Soviet Union objects to dis- of armed aggression against the nationaliza- the Suez Canal and the United Nations use Suez Canal for military purposes. In addi- he Soviet Union disapproves of the United s' position on the Panama Canal and of dis- atory measures taken by the American Zone ity towards vessels of Socialist States. The Union considers it necessary to eliminate bases and demilitarize the Canal Zones as as possible. (See also W76-12025) lias-Florida)
027

STATUS OF HISTORIC WATERS RINE AND PRACTICE),
Academy of Sciences, Moscow, Institute of d Law.

B. N. Nechaev.
In: Oceans, Technology and Law, Chapter 3, p 44-52, Moscow, USSR Academy of Sciences, 1972.

Descriptors: *Foreign countries, *International waters, *Law of the sea, *International law, Navigation, Political aspects, Law enforcement, Jurisdiction, Straits, History, Military aspects, Islands, Bays.
Identifiers: *Historic waters, *Historic bays, Archipelagos.

The 1958 International Convention on the Territorial Sea and Contiguous Zone lacks definitions and provisions concerning 'historic waters' and 'historic bays'. The norms of international maritime law are, therefore, controlling for activities of various countries in exercising sovereignty over 'historic waters'. It is generally recognized that 'historic waters' include straits, archipelagos, and bays. The following characteristic elements should be considered before classifying an area as a 'historic water': (1) the exercise of state authority over these waters for prolonged periods of time without opposition from the overwhelming majority of states; (2) the geographic condition of the bay, and its configurations; and (3) its economic and defense significance for that state. No unified opinion on the length of closing lines for bays has yet developed; consequently, states practices include exercise of jurisdiction over maritime areas adjacent to coasts which are vital to the state's security or economy. International experience has shown that states themselves first decide the condition and grounds upon which a bay is viewed as 'historic' and then international law sanctions the decision. (See also W76-12025) (Hadoulias-Florida)
W76-12028

LEGAL PROBLEMS OF THE TERRITORIAL SEA REGIME,
USSR Academy of Sciences, Moscow, Institute of State and Law.
L. V. Speranskaya.
In: Oceans, Technology and Law, Chapter 4, p 53-77, Moscow, USSR Academy of Sciences, 1972.

Descriptors: *Foreign countries, *Fishing, *Jurisdiction, *International waters, *Law of the sea, International law, Boundary disputes, Sea water, Coasts, Oceans, Continental shelf, Political aspects, Legal aspects, Fisheries.
Identifiers: *Territorial waters, *International Law Commission, *Territorial sea zone, Innocent passage.

The legal regulation of territorial waters, including questions regarding the breadth of the territorial seas, must take into account the level of scientific activity presently taking place in coastal seas. 'Territorial waters' means a belt of maritime space adjacent to the coastal state and measured either by a low-tide line or by the use of a straight baseline. The International Law Commission recognizes a twelve mile breadth extending into airspace above the territorial sea, as well as to the seabed and subsoil. Some states, however, in violation of international law, have declared a 200 mile wide territorial sea zone using self-defense as justification. These states require other nations to purchase licenses for exorbitant sums before allowing fishing within the 200 mile zone. However, they reserve sanitary and other pollution controls to a 12 mile zone only. (See also W76-12025) (Hadoulias-Florida)
W76-12029

THE OUTER BOUNDARY OF THE CONTINENTAL SHELF,
USSR Academy of Science, Moscow, Institute of State and Law.
S. N. Smirnov.
In: Oceans, Technology and Law, Chapter 5, p 78-98, Moscow, USSR Academy of Sciences, 1972.

Descriptors: *Foreign countries, *Jurisdiction, *Continental shelf, *International waters, *Law of the sea, International law, Boundary disputes, Legal aspects, Legislation, Sea water, Oceans, Military aspects, Water resources development, International commissions.
Identifiers: *Exploitability criteria, *International Law Commission, Geneva Convention.

The Continental Shelf, a rich source of minerals, needs special legislation delineating boundaries for spatial expansion of coastal states' sovereign rights. Relevant definitions and proposals for such legislation are included within this chapter. The most widespread definition of 'Continental Shelf' is the 'exploitability criteria' which states that the entire world ocean floor can be divided by median lines between coastal states. However, the International Law Commission after much debate adopted the geographical meaning of continental shelf. While outer boundaries of the Continental Shelf remain unclear, international legal norms allow coastal states sovereign rights over exploration and exploitation of the territorial sea to two hundred miles. Spatial extention of exploitability is limited only by the need for submarine regions to be contiguous to coastal states or islands. The United States agrees on the two hundred mile territorial sea, but recommends supervision by international trustees. (See also W76-12025) (Hadoulias-Florida)
W76-12030

THE DELIMITATION OF THE NORTH SEA CONTINENTAL SHELF,
Akademiya Nauk SSSR, Moscow. Inst. of State and Law.
A. L. Kolodkin.
In: Oceans, Technology and Law, Chapter 6, p 99-113, Moscow, USSR Academy of Sciences, 1972.

Descriptors: *Foreign countries, *Jurisdiction, *Continental shelf, *International waters, *Law of the sea. International law, Boundary disputes, Judicial decisions, Geographical regions, Political aspects, Legal aspects, International commissions, Beds, Water resources development.
Identifiers: Equidistance(Legal), Geneva Convention.

The International Court of Justice in 1969 examined differing principles for delimiting the Continental Shelf of the North Sea. Article 6 of the 1958 Geneva Convention provided for delimitation by agreements between states, or, in the absence of such agreements or special circumstances justifying another boundary, according to principles of equidistance. The Court decided that since the articles of the Convention did not bind non-Convention members, equidistance was not the sole method available for delimiting the Continental Shelf of the North Sea. The Court felt that other factors, such as the general configuration of the coast line, the physical and geological structure of the Shelf Area, and elements of 'reasonable proportionality' should also be taken into consideration. The Soviet Union's position is that the Rules of Article 6 and of other Convention articles are rules of Customary International Law and, therefore, binding on all states. Furthermore, the principle of equidistance should be applied only in the absence of specific agreements or special circumstances. (See also W76-12025) (Hadoulias-Florida)
W76-12031

SCIENTIFIC-TECHNOLOGICAL PROGRESS AND THE SEARCH FOR LEGAL REGULATION OVER POSSIBLE USES OF THE OCEAN FLOOR,
Akademiya Nauk SSSR, Moscow. Inst. of State and Law.
M. I. Lazarev.
In: Oceans, Technology and Law, Chapter 7, p. 114-129, Moscow, USSR Academy of Sciences, 1972. 16 p.

Descriptors: *Foreign countries, *Water resources development, *International waters, *Law of the sea, *International law, Regulation, Oceans, Subsoil, Geographical regions, Legal aspects, Technology, Political aspects, Treaties, International commissions, Mining, Ownership of beds.
Identifiers: *Seabeds, *Freedom of the high seas.

Various legal viewpoints have been presented for regulating development of the ocean floor and subsoil. These viewpoints include the 'legal vacuum', 'belonging to no one', 'belonging to everyone', and the 'common property of all mankind' concepts. The United Nations (UN) General Assembly adopted the last of these, to which the Soviet Union made the following objections: (1) the concept calls for equal rights to world ocean resources but ignores the basic differences between developed and underdeveloped states; (2) artificial divisions into nations 'working on the sea' and those 'reaping fruits of the sea' are created in contradiction to the UN Charter; (3) the concept may hinder scientific research and curtail technological initiatives; and (4) political propaganda for 'sharing the seabed' is beneficial to imperialistic powers. The Soviet Union suggests that until there arises a treaty regime mutually acceptable to all states for the common use of the seabed and subsoil, these areas should be commonly used by all states under principles of freedom of the high seas. (See also W76-12025) (Hadoulias-Florida)
W76-12032

LEGAL REGULATION OF SEABED USES BEYOND THE LIMITS OF THE CONTINENTAL SHELF,
Akademiya Nauk SSSR, Moscow. Inst. of State and Law.
G. F. Kalinkin.
In: Oceans, Technology and Law, Chapter 8, p. 130-70, Moscow, USSR Academy of Sciences, 1972. 41 p.

Descriptors: *Foreign countries, *Water resources development, *International water, *International law, *Continental Shelf, Regulation, Oceans, Legal aspects, Political aspects, Resources, Treaties, Legislation, Mining, Ownership of beds, Boundary disputes.
Identifiers: *Demilitarization, *Seabeds, Convention on the High Seas.

This chapter deals with several issues relating to the exploitation and use of the seabed. The Convention on the High Seas has confirmed that 'freedom of the high seas' also extends to the seabed. Consequently, a Disarmament Committee Treaty providing for demilitarization of the seabed has been approved. Various legal studies calling for establishment of an international legal regime for exploitation of seabed resources are reviewed. Also analyzed are U. N. studies advocating international machinery for regulation of the seabed by registering claims for seabed resource exploitation through licensing procedures, or by conducting such exploitation under the supervision of an independent international agency. The American Draft Convention, by comparison, has proposed an international trusteeship area where states adjacent to the area would have power to issue licenses for exploitation of seabed mineral resources. The Soviet Union, however, deems it unnecessary to develop international machinery until boundaries of national jurisdiction for the seabed have been established. Also discussed is the UN proclamation declaring the seabed and the ocean floor to be the 'common heritage of mankind'. (See also W76-12025) (Hadoulias-Florida)
W76-12033

INTERNATIONAL-LEGAL PROTECTION OF THE SEAS FROM POLLUTION,
Akademiya Nauk SSSR, Moscow. Inst. of State and Law.
Ya. A. Ostrovski.
In: Oceans, Technology and Law, Chapter 9, p 171-93, Moscow, USSR Academy of Sciences, 1972.

Descriptors: *Foreign countries, *Oil spills, *International waters, *Law of the sea, *International law, *Oil pollution, Pollution, Legal aspects, Political aspects, Legislation, Treaties, Radioactivity effects, Ecology, Environmental effects, Water pollution effects, Oceans, International commissions.
Identifiers: *Law of the Sea Conference.

The danger of oil pollution in international waters is critical. Pollution control measures began in 1926 when a preliminary conference of experts drafted an agreement recommending the establishment of government zones in which the discharge of gasoline and other harmful mixtures would be prohibited. Other conventions followed. Discussed are the International Convention in London in 1954 and the 1962 Amendments thereto which established different regimes according to ship type; the 1969 North Sea Convention; the 1969 Baltic Sea Convention; and the 1969 Conference in Rome and Brussels. In addition to oil pollution, other dangerous areas of pollution examined includes pollution in rivers and internal reservoirs from sewage, industrial wastes, various chemical substances, and radioactive contaminations. The Geneva Law of the Sea Conference recognized the need to adopt international measures to prevent dumping radioactive wastes into the sea. With modern technological advances, possible uses of the world's oceans are limited only by the dangers of pollution. (See also W76-12025) (Hadoulias-Florida)
W76-12034

INTERNATIONAL-LEGAL REGULATION OF MARINE FISHERIES,
A. A. Volkov.
In: Oceans, Technology and Law, Chapter 10, p. 194-209, Moscow, USSR Academy of Sciences, 1972.

Descriptors: *Foreign countries, *Jurisdiction, *International waters, *Law of the Sea, *Fisheries, Regulation, Oceans, Legal aspects, Legislation, Political aspects, Fish, Fish management, International commissions.
Identifiers: *Law of the Sea Conference.

Effective regulatory methods are necessary to control the exploitation of the living resources of the world's oceans. The most urgent concerns involve the establishment of a territorial sea width and fishing zone, and the resolution of problems of coastal states' rights in the high seas and in marine fisheries. The regulation of fisheries is complicated by differing international legal regimes concerning internal waters, territorial seas, high seas, and the Continental Shelf. The situation is further aggravated by the inability of the Law of the Sea Conferences to reach agreement on general rules establishing maximum limits for the breadth of territorial seas and fishing zones. Of particular interest are the positions expressed by American and Canadian fishermen, and the tendency of individual coastal states unilaterally to seize vast areas of the high seas. The Soviet Union objects to the organized activity by capitalist coastal states against Soviet fisheries. The Soviets especially object to the establishment of official prohibitions on port ships for Soviet fishing vessels in Canadian, Mexican and Australian Pacific Ocean ports. (See also W76-12025) (Hadoulias-Florida)
W76-12035

INTERNATIONAL-LEGAL PROTECTION OF THE LIVING RESOURCES OF THE SEA,
Akademiya Nauk SSSR, Moscow. Inst. of State and Law.
G. A. Nekrasova.
In: Oceans, Technology and Law, Chapter 11, p 210-226, Moscow, USSR Academy of Sciences, 1972.

Descriptors: *Foreign countries, *Water resources development, Technology, *International waters, *Law of the sea, Legislation, Pollution, Water pollution, Treaties, Regulation, Environmental effects, Conservation, Resources, Sea water, Oceans, Aquatic animals, Aquatic life, Mining wastes.
Identifiers: *Declaration on the Continental Shelf of the Baltic Sea.

The living resources of the Baltic Sea urgently need protection to prevent their extermination by harmful side effects of scientific progress. Resolution of technology caused problems is proceeding through international programs and agreements for joint exploitation of marine resources. International organizations are also conducting scientific studies of marine living resources and conservation measures. There were no international agreements for the conservation of living resources of the sea prior to 1911, but since then a number of international conferences have been devoted to the problem. The Soviet Union has given high priority to protecting the Baltic Sea. A number of international scientific conventions have discussed Baltic Sea pollution concerns; however, up to now the Baltic States have not concluded any regional agreement assuring protection of the area. Thus the Declaration on the Continental Shelf of the Baltic Sea should play an important political and legal function in protecting Baltic Sea ecology. (See also W76-12025) (Hadoulias-Florida)
W76-12036

WORLD ENVIRONMENTAL QUALITY.
Department of State, Washington, D.C.
For primary bibliographic entry see Field 6G.
W76-12037

THE SWALE,
Spessard L. Holland Law Center, Gainesville, Fla.
J. J. Altman, Jr.
Available from Eastern Water Law Center, University of Florida, Gainesville, Florida 32611 for $1.25. June 4, 1976, 25 p.

Descriptors: *Florida, *Surface drainage, *Natural flow doctrine, *Landfills, *Obstruction to flow, *Reasonable use, Alteration of flow, Relative rights, Riparian rights, Riparian waters, Ditches, Grassed waterways, Surface runoff, Surface waters, Drainage patterns(Geologic), Damages, Land tenure, Permits.
Identifiers: *Swales.

A 'swale', which is a watercourse carrying surface runoff, may contain flowing water all year-round or may serve only during flooding or rainfall periods. A swale may be natural, man-made or natural but enlarged artificially. In considering the right of a property owner to fill a swale, the natural or artificial nature of the waterway is important. Under Florida law a swale, as a 'man-made trench which is water filled only during rainfall', may be constructed and maintained without a permit. Under Federal law a similar provision exempts man-made ditches. Natural watercourses, however, may be subject to Federal Water Pollution Control Act jurisdiction and may present state common law problems. Under Florida law a lower downer may not block natural drainage of upper lands. In addition, the lower landowner is required to submit to all natural drainage running in a natural direction. If the swale is entirely man-made, however, and is not an improved natural drainage course, a landowner may fill the ditch. Fill would also be allowed if the ditch were carrying water other than surface drainage, as when a ditch drains a water body. Except in these limited instances, however, filling is not permitted. (Comer-Florida)
W76-12038

AVIGABLE WATER, A DEFINITION: ALL ENT OUT OF SHAPE,
essard L. Holland Law Center, Gainesville, Fla.
G. Madorsky.
vailable from Eastern Water Law Center, niversity of Florida, Gainesville, Florida 32611, 20. (1975), 44 p.

scriptors: *Federal jurisdiction, *Navigable ters, *Rivers and Harbors Act, *Federal Water llution Control Act, Legislation, Constitutional , Common law, Regulation, Water pollution ntrol, Water law, History, Rivers, Jurisdiction. ntifiers: *Navigability test, *FWPCA Amendnts of 1972, Oil Pollution Act, Navigation obuctions.

e Federal Constitution grants Congress the wer to regulate the navigable waters of the ntry under the Commerce Clause. The earliest icial interpretation of navigable waters was ed upon the English rule and encompassed only l waters. Since many major river systems were s excluded, the United States Supreme Court pted the 'navigability in fact test'. This test inled all waters that were used or susceptible of in their natural condition as commercial ways. Eventually, interstate waters, waters able of improvement to become navigable as l as tributary waters to navigable waters were ght under federal jurisdiction by judicial idening. With the beginnings of pollution con-, federal legislation was used to regulate gable waters. The legislation was not pletely effective, however, because of the e of federal jurisdiction. The Federal Water ution Control Act Amendments of 1972 pured to apply to all waters in the United States. e the act has been found constitutional, the der scope of jurisdiction promises better lt. (Comer-Florida)
-12039

TERS: NUMBERLESS YET MEAGER,
sard L. Holland Law Center, Gainesville, Fla.
Parker.
lable from Eastern Water Law Center, ersity of Florida, Gainesville, Florida 32611, August 1975, 27 p.

riptors: *Florida, *Water conservation, er demand, *Water supply, *Water shortage, e water intrusion, Water levels, Aquifers, ian rights, Use rates, Water utilization, r rates, Water costs, Water policy, Water gement(Applied), Water distribu-Applied), Water resources development, r law.
ifiers: Water rights(Non-riparian).

te ample rainfall, Florida is now faced with conservation problems. The tremendous ation growth of the state and inefficient ge systems have resulted in lower aquifers thern portions of the state. Because of lower rs, salt water intrusion has become a growncern. Solutions to these problems are not For example, any attempt to impose populaowth limits would present unfavorable cononal issues. As to the water shortage m, borrowing water from neighboring states a temporary measure at best since many tates may well balk at transporting water to orida. One possible answer to the difficulty er use charges. Massive amounts of water rently used for industrial and agricultural es, with much of it free because of the n rights system now governing water law in te. These riparian rights have resulted in on of a natural resource at a time when on has become a serious problem. If major re made to pay for the water they use, use ay be reduced for the remainder of the (Comer-Florida)
040

AGRICULTURAL PRACTICES TO REDUCE NON-POINT POLLUTION IN THE OKEECHOBEE-KISSIMMEE BASIN,
Florida Univ., Gainesville. Inst. of Food and Agricultural Sciences.
L. B. Baldwin.
Available from Eastern Water Law Center, University of Florida, Gainesville, Florida 32611, $3.10 May 1975. 62 p, 1 fig, 6 tab.

Descriptors: *Agricultural runoff, *Florida, *Lake basins, *Farm wastes, *Confinement pens, Feed lots, Livestock, Cattle, Fertilizers, Crop production, Phosphorus compounds, Nitrogen compounds, Surface runoff, Vegetation effects, Wetlands, Drainage water, Water pollution sources, Water pollution treatment, Water pollution control.
Identifiers: Non-point sources(Pollution), *Okeechobee-Kissimee Basin(Fla).

Agricultural sources of non-point source pollution in the Okeechobee-Kissimmee Basin of Florida are predominantly dairies, beef production in improved pastures, sugarcane and vegetables on mucklands, and citrus on drained soils. Cattle production contributes significant amounts of phosphorus while crop production is the main source of nitrogen. Quantities of both elements can be reduced by utilization of wetlands to slow runoff and increase nutrient uptake prior to discharge into waterways. Use of methods to prevent herd cattle from congregating around drainage areas can keep manure from accumulating and flushing into drainage facilities. Feeding areas should also be spread out away from drainage areas and vegetable cover maintained to prevent nutrient wash-off. Dairy operations require a close confinement of cattle for long periods. This makes capture and disposal of wastes both necessary and feasible. If feed crops are raised the expense of waste collection can be mitigated. (Comer-Florida)
W76-12041

LEGAL STANDARDS FOR DETERMINING THE ORDINARY HIGH WATER MARK,
Spessard L. Holland Law Center, Gainesville, Fla.
R. W. Winesett.
Available from Eastern Water Law Center, University of Florida, Gainesville, Florida 32611, $1.75. 1972, 35 p.

Descriptors: *Florida, *Boundaries(Property), *High water mark, *Fluctuations, *Water levels, Texas, Arizona, Utah, Oklahoma, Oregon, Water law, Banks, Ownership of beds, Seashores, Tidal waters, Judicial decisions, Legal aspects.

Legal standards for ascertaining the ordinary high water mark have never been clear. Examined here is federal and Florida case law, as well as that of Texas, Arizona, Utah, Oregon and Oklahoma. In general, it appears that the ordinary high water mark (OHWM) is the outer limit of the land beneath navigable waters. However, the OHWM is a question of fact, to be determined by visual examination of the bank. While physical evidence has been accepted in the form of changed soil appearance at the water's edge or lack of terrestrial vegetation, the cases are by no means uniform. Thus, while it is a question of fact that determines the OHWM, as yet there is no universally accepted standard. (Frank-Florida)
W76-12042

EBB AND FLOW: NAVIGABILITY AND THE CORPS OF ENGINEERS WASHED IN THE TIDE OF ENVIRONMENTAL PROTECTION,
Spessard L. Holland Law Center, Gainesville, Fla.
C. P. Tittle.
Available from Eastern Water Law Center, University of Florida, Gainesville, Florida 32611, $1.60. 1972. 32 p, 2 append.

Descriptors: *Wetlands, *Judicial decisions, *Jurisdiction, *Federal government, *Dredging, Legislation, Legal review, Water policy, Constitutional law, Federal jurisdiction, Florida, Water law, High water mark, Landfills.

Navigability has been the cornerstone of federal power to enforce environmental wetland protection. Under the Commerce Clause and federal jurisdiction, the Corps of Engineers has issued and withheld permits for dredging and filling until 1970, however, jurisdiction had always depended on navigability of a waterbody. In 1970 a Fifth Circuit decision, Zabel v. Tabb, allowed the Corps to consider environmental factors in issuing permits. This landmark decision was implemented by a federal court in Florida which granted a permanent injunction against dredging, and even went so far as to order repairs. These Florida cases have greatly expanded the breadth of federal protection for wetlands. To a large degree, state power has been pre-empted, while the reach of the Commerce Clause has been greatly expanded. (Frank-Florida)
W76-12043

PUBLIC SERVITUDE FOR NAVIGATION ON ARTIFICIAL WATERS AND THE COMMERCE CLAUSE,
Spessard L. Holland Law Center, Gainesville, Fla.
R. L. Wilkes.
Available from Eastern Water Law Center, University of Florida, Gainesville, Fl. 32611. $1.55. (1973), 31 p.

Descriptors: *Artificial watercourses, *Florida, *Constitutional law, *Federal jurisdiction, *Navigable rivers, Navigable waters, Navigation, Water law, Legislation, Legal aspects, Judicial review, State governments, State jurisdiction, Beneficial use, Public rights.

The Commerce Clause of the Constitution, and the power of Congress to regulate navigable waters, constitute the foundation of all federal power over rivers and other waterways. Where artificial waterways are concerned, there are two ways to bring them within the Commerce Clause since they are not otherwise covered. First, one may show that the waterbody is in fact navigable; or second, one may show that it is navigable because it is capable of improvements. There is little case law dealing with Federal power in this area, but state case law is extensive. The author, after discussing cases from around the nation, concludes that whether or not public rights existed in a waterbody in its natural condition will determine whether public rights exist after it is made navigable by artificial means. Florida law on this point, both statutory and judicial, is also discussed. (Frank-Florida)
W76-12044

THE BENEFICIAL USE OF WATER RESOURCES AND GUIDELINES FOR ALLOCATION OF WATER RESOURCES IN TIMES OF EMERGENCY,
Spessard L. Holland Law Center, Gainesville, Fla.
D. L. Rankin.
Available from Eastern Water Law Center, University of Florida, Gainesville, Florida 32611, $1.85. March 1973, 37 p.

Descriptors: *Beneficial use, *Water allocation(Policy), *Water resources, *Droughts, *Florida, Riparian rights, Riparian land, Appropriation, Prior appropriation, Water rights, Water law, Texas, Idaho, California, Adoption of practices, State governments.
Identifiers: *Public trust doctrine.

Examined here are the beneficial uses of water resources in Florida, and guidelines for water resource allocation in times of emergency. Both are affected by the Florida Water Resources Act of 1972 which replaces certain common law con-

cepts of water rights. A discussion of the Model Water Code, from which the Act comes, includes a comparison of traditional reasonable use and beneficial use concepts. Ultimately, Florida has synthesized elements of both riparian and appropriation law. After delineating procedures for a water emergency declaration under the Act; the author suggests that where the priority system is inexact, as in Florida, four classes of permits be used. Water emergency proceudres in Texas, California and Iowa are also compared and analyzed. (Frank-Florida)
W76-12045

FEDERAL JURISDICTION OVER LANDFILLS ON SUB-AQUEOUS LANDS,
Spessard L. Holland Law Center, Gainesville, Fla.
J. M. Wehby.
Available from Eastern Water Law Center, University of Florida, Gainesville, Florida 32611, $1.65. November 1973. 33 p, 2 append.

Descriptors: *Protection, *Estuaries, *Federal jurisdiction, *Wetlands, *Rivers and Harbors Act, Constitutional law, Estuarine fisheries, Estuarine environment, Legal aspects, Judicial decisions, Legal review, Environmental effects, Environmental control, Legislation, Federal government.

Estuarine land has long been the victim of dredge, fill, and bulldozing. States have been unwilling or unable to protect these submerged areas. The federal government has thus had responsibility for much of the estuarine areas, subject to certain limitations. Courts have lately been expanding federal jurisdiction in these areas, basing their decisions on the Commerce Clause and the 1899 Rivers and Harbors Act. The author evaluates the protective effectiveness of the federal jurisdiction, and finds the results encouraging. Since Corps of Engineering permits are required in these areas, there has been an effective control on misdirected development. Submerged lands below the mean high water mark have been well protected, while protection of wetlands above the mark has been inadequate. To increase jurisdictional and protective effectiveness, the author recommends an amendment to the Rivers and Harbors Act to allow citizen suits. Overall, however, federal jurisdiction under the Act is sufficient to protect the environment. (Frank-Florida)
W76-12046

USE OF THE 'TRUST DOCTRINE' FOR WETLANDS PROTECTION,
Spessard L. Holland Law Center, Gainesville, Fla.
C. Felton.
Available from Eastern Water Law Center, University of Florida, Gainesville, Florida 32611, $1.65. (1973), 33 p.

Descriptors: *Protection, *Florida, *Constitutional law, *Judicial review, *Wetlands, Water policy, Water resources, Public access, Public rights, Public benefits, Water law, Wisconsin, Massachusetts, California, Water rights, History, Legal aspects, Beaches.
Identifiers: *Public trust doctrine.

The public trust doctrine is one favored method of protecting wetlands, especially beaches below the high tide line and river bank bottoms. It is as old as the common law, and in fact found its roots in the conflicts between weak English kings and their powerful lords. The author traces the doctrine's history from its beginnings to the present. Also examined is how the doctrine functions in different states, including California, Wisconsin and Massachusetts. Extensive coverage is given to the Florida constitutional provision establishing the doctrine. Relevant case law, both in and out of Florida, is analyzed along with the advantages that the provision gives the public as compared to previous legislation. Overall, establishment of the provision seems to be a step forward for wetland conservation in Florida. (Frank-Florida)
W76-12047

EFFLUENT CHARGES, TOWARDS A NEW ENVIRONMENT,
Spessard L. Holland Law Center, Gainesville, Fla.
C. E. Nilson.
Available from Eastern Water Law Center, University of Florida, Gainesville, Florida 32611, $1.65. (1973), 33 p.

Descriptors: *Costs, *Penalties(Legal), *Water pollution treatment, *Water pollution control, *Legislation, Legal aspects, Cost sharing, Cost-benefit analysis, Cost allocation, Economics, Water policy, Feasibility, Econometrics, Unit costs, Treatment facilities.

The basic question concerning effluent discharges today is that of financial responsibility when illegal discharges occur. Presently the public pays in the form of higher taxes for sewage treatment plants and other facilities. No incentive is given to the polluting industries to cut down. A more efficient system would impose effluent discharge rates on each industry. This way, it would cost the polluters to pollute. Since 80 to 90% of all wastes can be re-cycled, industry would have the incentive to stop pollution. Furthermore, effluent charges when imposed would result in higher unit retail prices, thus making a company less competitive. The Ohio plan is cited as an example of successful effluent discharge rates in this context. (Frank-Florida)
W76-12048

THE TAKING ISSUE, FLOOD PLAIN AND WETLANDS ZONING,
Spessard L. Holland Law Center, Gainesville, Fla.
D. E. Thomas.
Available from Eastern Water Law Center, University of Florida, Gainesville, Florida 32611, $1.20. May 1975, 24 p.

Descriptors: *Flood plain zoning, *Water zoning, *Constitutional law, *Regulation, *Reasonable use, Land use, Recreation, Parks, Industries, Land tenure, Natural resources, Watersheds(Basins), Land classification, Land development, Topography, Land resources, Land management, Real property, Land appraisals, Economics, Eminent domain.
Identifiers: Fill permits.

Preventing development of flood plains and wetlands by zoning is a relatively recent phenomenon. A major question arising from such zoning is whether the effect is such as to be a 'taking' of property without compensation. The traditional test used to determine whether a regulation is actually a taking is the diminution of value test. Under that test, a taking occurs if the owner is deprived of any reasonable use of his property. A number of private property oriented courts have used this test to strike down flood plain and wetland zoning. According to these courts, agricultural, recreational and parkland uses are not reasonable uses. Some other courts, however, have declared the allowable uses to be reasonable. These courts have apparently weighed public interests more heavily than private use. The most innovative consideration of the taking issue was made by a Wisconsin court. According to that forum, police power exercised to protect the public from harm cannot be a taking. Eminent domain taking is exercised only for public benefit; retaining natural land forms is not a benefit but merely a protection from harm. (Comer-Florida)
W76-12049

A SURVEY OF THE VARIOUS STATE POWER PLANT SITING LAWS,
Spessard L. Holland Law Center, Gainesville, Fla.
J. Sproull.
Available from Eastern Water Law Center, University of Florida, Gainesville, Florida 32611, $1.65. 1975, 33 p.

Descriptors: *Sites, *Power plants, *Florida, *State governments, *Planning, Utilities, Air pollution, Water pollution, Permits, Thermal pollution, Water resources, Water utilization, Energy, Arizona, Arkansas.
Identifiers: *Licenses, *Florida Power Plant Siting Act.

With the present expansion of energy facilities, there has been a surge in environmental challenges to these facilities. Seventeen states have responded by passing power plant siting laws. Examined here are the siting law of the various states, their strengths and weaknesses. In addition, a comparison is made between the Florida Power Plant Siting Act with similar acts of other states, including: Arizona, Arkansas, California, Connecticut, Kentucky, Maryland, Massachusetts, Minnesota, Montana, Nevada, New Hampshire, New York, Ohio, South Carolina and Florida. (Frank-Florida)
W76-12050

FEDERAL REGULATION IN THE LICENSING OF NUCLEAR POWER PLANT FACILITIES,
Spessard L. Holland Law Center, Gainesville, Fla.
R. L. Oftedal.
Available from the Eastern Water Law Center, University of Florida, Gainesville, Florida 32611. Price $1.75. June 1976, 35 p.

Descriptors: *Administrative agencies, *Federal government, *Nuclear power plants, *Nuclear reactors, *Permits, Nuclear energy, Nuclear engineering, Thermal pollution, Fishkill, Heated water, Heat balance, Heat flow, Rivers, Streams, Water law, Administrative decisions, Administration.
Identifiers: *National Environmental Policy Act, *Licenses.

Nuclear plant construction has been a source of controversy throughout the last two decades. Examined here is the plant licensing process in the light of new and existing federal regulations and judicial decisions, and the rate and effectiveness of the regulatory agencies involved. A licensing process that extends over a decade may be unjustifiable in light of rapid technological development. Also analyzed are application procedures, the effect of the National Environmental Policy Act, and other water quality control legislation. The passage of the Nuclear Facility Licensing Act would shorten the licensing process by three to four years. Generic rulemaking and increased standardization are also steps that need to be taken. Delays in licensing, if uncorrected, could lead to greater interest in conventional energy production, especially since the goals set by President Ford for 1980 already seem unlikely to be reached. (Frank-Florida)
W76-12051

LEGAL PROBLEMS OF MARINA CONSTRUCTION AND CHANNEL MARKER INSTALLATION IN FLORIDA,
Spessard L. Holland Law Center, Gainesville, Fla.
W. M. Clifford.
Available from the Eastern Water Law Center, University of Florida, Gainesville, Florida 32611. Price $1.90. May 1976, 38 p.

Descriptors: *Construction, *Permits, *Florida, *Marinas, *Channels, Riparian rights, Judicial review, Facilities, Recreation facilities, Boat Docks, Coastal structures, Federal government, Recreation, Water sports, Legislation, Legal aspects.
Identifiers: *Licenses.

Examined here are the legal problems raised in connection with the proposed building of a marina and the proposed installation of channel markers to help boaters using a marina in Florida. The recent surge of environmental concern has generated many complications, requiring a po

l marina builder to consider some or all of the lowing: common law riparian rights; state per-s for marina construction; rules of water nagement districts; rules of the Department of vironmental Regulation; relevant case law; uirements for federal permits; the question of ether prohibition of the marina would con-ute a taking under the Fifth Amendment; and regulations dealing with channel markers. Since h federal and state permits are required, a der must comply with two sets of requirements ch are not always complementary. He must consider potential liability for damage to ad-nt land. (Frank-Florida)
5-12052

LIC BEACH ACCESS: GUARANTEEING A CE TO SPREAD YOUR TOWEL,
ssard L. Holland Law Center, Gainesville, Fla.
. Parrish, Jr.
ilable from the Eastern Water Law Center, versity of Florida, Gainesville, Florida 32611, e $1.60. 1976, 32 p.

riptors: *Florida, *Beaches, *Legal aspects, shores, *Public access, Legislation, Sands, criptive rights, State governments, Federal rnment, Coasts, Shores, Eminent domain, c rights, Public benefits, Public lands.
ifiers: *Public trust doctrine, *Coastal Zone agement Act.

h access in Florida has been greatly reduced ent years, due both to erosion and to growing te control of upland areas. Examined here are ommon law theories pertaining to beach ac-recent federal and state legislation, Florida aw, and those portions of the Coastal Zone gement Act relating to the problem. Beach s may be secured to the public through any er of methods and theories, including: jus um; custom; dedication; prescription; public doctrine; mandatory dedication; eminent n; and the police power. Direct treatment by legislatures would, of course, be the best d to secure public rights in beach areas. a's legislation, however, is spread out and the impact of the beach access legislation d by Texas and Oregon. (Frank-Florida)
2053

D PROTECTION ZONING AS A FACTOR CTERMINING DAMAGES IN EMINENT IN PROCEEDINGS,
rd L. Holland Law Center, Gainesville, Fla.
brook.
ble from the Eastern Water Law Center, sity of Florida, Gainesville, Florida 32611, 1.30. (1976), 26p.

tors: *Florida, *Wetlands, *Damages, plain zoning, *Eminent domain, Property Constitutional law, Compensation, Zon-gislation.

nstitutional validity of flood plain zoning is r to be determined on a case by case basis. court determines that a zoning regulation s to a constitutional taking, the state should eminent domain proceedings to determine ropriate compensation payment to the in-wner. The traditional damages measure-eminent domain proceedings is the price pon at sale between a willing seller and a buyer. Because of this formula, the flood nd wetlands ordinance itself becomes a damages determination since a purchaser rtainly consider it. The effect of the zon-property value usually is depressive zoning restricts use. While some courts le to such evidence because of suspicion tive intent to depress such value, Florida r state courts are not hostile and allow of value depression. So long as there is an a speculative possibility of zoning he effect of such change on land value can be considered as damages evidence. (Comer-Florida)
W76-12054

COASTAL ZONE MANAGEMENT IN FLORIDA: THE NEED FOR A COMPREHENSIVE PROGRAM,
Spessard L. Holland Law Center, Gainesville, Fla.
P. Coutney.
Available from the Eastern Water Law Center, University of Florida, Gainesville, Florida 32611, Price $5.15. (1975), 103 p.

Descriptors: *Erosion, *Florida, *Coastal plains, *Coastal marshes, *Legislation, Seashores, Beaches, Shores, Planning, Water resources, Water law, Future planning(Projected), Coasts, State governments, Water resources development, Federal government.
Identifiers: *Coastal waters, *Coastal zone management.

This note presents a system of suggested legislative reforms that would reconcile coastal zone management with conflicting land use demands. Florida coastal zone law is emphasized. Sources of funding are listed, mainly from the federal government, that would finance anticipated state programs. The main example of suggested legislation is a proposed coastal zone management act for Florida. The author sees legal weaknesses in that there is no comprehensive plan for development; furthermore, not all coastal land is regulated. Only submerged lands and beaches are protected when threatened by erosion even though the entire coastal zone should be protected. Finally, the author favors the establishment of a distinct coastal zone agency, although it should be kept within the confines of an overall state plan. (Frank-Florida)
W76-12055

MAJOR WATER LAW SYSTEMS: A COMPARATIVE STUDY OF THE UNITED STATES AND SPAIN,
Spessard L. Holland Law Center, Gainesville, Fla.
D. Fernandez.
Available from Eastern Water Law Center, University of Florida, Gainesville, Florida 32611, $1.30. (1976), 26 p.

Descriptors: *Water law, *United States, *Foreign countries, *Administration, *Appropriation, Prior appropriation, Riparian rights, Water resources, Water resources development, Riparian land, Water utilization, Usufructuary right, Legal aspects, Agriculture, Industry.
Identifiers: *Spain, *Comparative water law(US-Spain).

Because an adequate water supply is essential for agriculture and industry, laws governing water have always been a major concern of governments. This paper deals with the water law systems of Spain and the United States, noting similarities and differences, as well as the reasoning and tradition leading to the development of the various systems. A history and explanation are given for riparian rights and riparian land, prior appropriation, and the administrative permit systems in the United States. Spanish water law consists mainly of codified traditional water law, going back as far as Roman times. Semi-arid Spain is subject to uneven rainfall patterns. This, along with industrialization, has created a need for more modern water law. Thus, the trend towards a modern administrative type system in Spain should continue. (Frank-Florida)
W76-12056

RESIDENTIAL DEVELOPMENT A LOOK AT THE REGULATORY CONTROLS OF FLORIDA'S WATER RESOURCES,
Spessard L. Holland Law Center, Gainesville, Fla.
T. S. Hart.
Available from Eastern Water Law Center, University of Florida, Gainesville, Florida 32611, $2.25. June 1976, 45 p.

Descriptors: *Florida, *Legislation, *Administrative decisions, *Permits, *Dredging, Floods, Insurance, Consumptive use, Wetlands, Legal aspects, Waste water disposal, Sewage, Sewage treatment, Environmental effects, Environmental control, State governments.
Identifiers: *Licenses.

The legal problems of small-scale land development are many when it comes to the use and ownership of water resources. Examined here are the problems facing a developer who must comply with a maze of conflicting, overlapping regulations and statutes in Florida. The first step is to determine what kind of water resources are in question; this will direct counsel to the proper body of law. Potential problem areas discussed include: flood insurance; dredge and fill restrictions; consumptive use of fresh water; sewage and waste water disposal; and wetlands legislation. The Environmental Reorganization Act of 1975 is considered helpful since it provides a centralized authority for environmental affairs, as well as delegates decision-making powers to a regional district level. The Act also consolidates all planning operations and permits in Florida. (Frank-Florida)
W76-12057

LANDOWNER'S AUTHORITY TO PROTECT PROPERTY ABOVE ORDINARY HIGH WATER LINE FROM SEASONAL FLOODING,
Spessard L. Holland Law Center, Gainesville, Fla.
L. Strothman.
Available from Eastern Water Law Center, University of Florida, Gainesville, Florida 32611, $1.60. 1976, 32 p.

Descriptors: *Florida, *High water mark, *Floods, *Surface waters, *Flood protection, Judicial review, Earthworks, Embankments, Structures, Dikes, Barriers, Jetties, Levees, Retaining walls, Diversion losses, Diversion structures, Legal aspects.
Identifiers: *Fill permits.

Examined here is whether in Florida one may be liable for damages to another resulting from personal flood protection construction. Generally, under Florida and civil law, one will be liable. A riparian owner does not have the right to build a structure along a stream bank when such structure will cause ordinary flood waters to damage the lands of others. Aside from judicially-imposed requirements there are statutory requirements for state permits, as well as federal requirements. Thus, any landowner seeking to build dikes or other related structures should acquire the necessary local, state and federal permits. (Frank-Florida)
W76-12058

ARIZONA WATER COMMISSION.
Ariz Rev Stat Ann secs 45-501 thru 45-513 (1956), as amended, (Supp 1975).

Descriptors: *Adoption of practices, *Arizona, *Organizations, *Administration, *Administrative agencies, Administrative decisions, Water, Water allocation(Policy), Water resources, Water law, Planning, Projects, Water resources development, State governments, Regulation, Legislation, Water management(Applied).
Identifiers: Administrative regulations.

The terms, composition, qualifications and compensation of the Arizona Water Commission are hereby enacted. Provisions are included for the hiring of state water engineers, executives and other employees and consultants. Powers are delineated, including the right of the Commission to sue, prosecute and defend all rights, and to formulate plans and develop programs for water use.

It shall coordinate its rulings and activities with other state agencies and with the U. S. Secretary of the Interior. Its power of agreement is limited, subject to approval in each instance by the state legislature. All acquired property shall be public and tax-exempt, and gifts of land or money may be accepted. All developers shall submit water supply plans to the Commission. (Frank-Florida).
W76-12059

FLOOD CONTROL.
Ariz Rev Stat Ann secs 45-2301 thru 45-2370 (1956), as amended, (Supp 1975).

Descriptors: *Adoption of practices, *Administrative agencies, *Arizona, *Flood control, *Flood plains, Dam construction, Right-of-way, Rivers, Taxes, Financing, Control, Water control, Flood protection, Building codes, Flood plain zoning, Protection, Water control, Floods, Local governments.

Arizona has enacted flood control legislation including the following provisions: five or more holders of flood-endangered lands may organize a flood control district subject to the approval of the state board of supervisors. Such status shall allow the procurement of assistance from the federal government under the 1948 Flood Control Act, as well as under general acts of Congress. Special laws pertaining to different Arizona municipalities shall take effect, enabling such municipalities to organize flood-control plans under specific projects already planned. In addition, the Arizona Water Commission shall set all regulations for construction and planning in designated floodplain areas, but only after public hearings have been held. Rules and regulations for the creation and operation of special flood control districts are herein enacted, including powers of directors and financial methods of project-funding. Powers to tax and create rights-of-way are also enacted. (Frank-Florida)
W76-12060

STATE WATER AND POWER PLAN.
Ariz. Rev. Stat. Ann. secs 45-2501 thru 45-2501 (Supp 1975).

Descriptors: *Arizona, *Power system operation, *Water resources, *Water supply development, *Construction, Water rates, Developed waters, Electric power, Dams, Aqueducts, Electric power plants, Dam construction, Financing, Eminent domain, Contracts, Control.

Arizona has enacted a comprehensive water and power plan designed to enable the state to use its share of the Colorado River water. The plan specifies projects to be built, ranging from aqueducts to hydroelectric plants. The Arizona Water Commission shall have exclusive power to plan, construct, operate and acquire land regarding this development. It shall also have the power to issue notes and bonds for financial obligations. Eminent domain shall take precedence over private land where water rights are concerned. Furthermore, the Commission shall have the authority to set all water rates and to enter into contracts to effectuate the plan. Finally, the legislation provides that there shall be created a state water and power development fund for purposes of securing all bonds and notes. (Frank-Florida)
W76-12061

GROUND WATERS.
Ariz Rev Stat Ann secs 45-301 thru 45-324 (1956), as amended, (Supp 1975).

Descriptors: *Arizona, *Groundwater, *Groundwater basins, *Groundwater resources, *Drilling, *Wells, Well regulations, Well permits, Penalties(Legal), Permits, Legal aspects, Regulation, Subsurface waters, Water permits, Judicial decisions, Deep wells, Administrative agencies.

Arizona has enacted legislation directing the State Land Department to administer all laws pertaining to groundwater. The Department is authorized to designate, when necessary, groundwater basins and subdivisions. Such designation may also be made in response to a petition of not less than 25 users in a groundwater basin. Other provisions prohibit drilling in a groundwater area without a permit. Drilling in general requires full advance notice to the Department, as well as completion of the drilling within one year. Hearings on designation shall be public with advance notice of at least four weeks. The legislation also regulates wells, providing that wells may be deepened or widened upon a showing that they will be insufficient to irrigate the land within five years of application for the permit to widen or deepen. Completion reports are required. Waste is prohibited; caps and valves may be required. Categories of wells exempt from this act are listed, including those for domestic and stock consumption. Penalties for violation of these provisions include fines up to $250 per offense per day. (Frank-Florida)
W76-12062

WATER RIGHTS (RECOGNITION OF EXISTING RIGHTS AND NONRECOGNITION OF RIPARIAN RIGHTS).
Ariz Const art 17.

Descriptors: *Arizona, *Riparian rights, *Prior appropriation, *Water law, *Constitutional law, State governments, Legislation, History, Judicial decisions, Common law, Diversion, Water rights.

Arizona does not recognize riparian water rights and in fact denies the validity of any such rights in its state constitution. The constitution does, however, recognize and confirm existing rights to use of water. The accompanying 'notes of decisions' to this article provide the historical background for Arizona's position. (Comer-Florida)
W76-12063

DEPARTMENT OF HEALTH SERVICES (FUNCTIONS IN WATER POLLUTION CONTROL).
Ariz Rev Stat Ann secs 36-132, 36-136 (1974).

Descriptors: *Treatment facilities, *Arizona, *Water pollution control, *State governments, *Legislation, Water law, Water pollution, Water treatment, Water pollution sources, Water pollution treatment, Water consumption, Pollutants, Pollution abatement, Swimming, Swimming pools, Public health.

Arizona has enacted legislation providing that the state department of health services shall: supervise the planning, construction, alteration and operation of all sanitary engineering facilities; establish and enforce regulations providing for the classification of water treatment plants, waste water treatment plants and waste water collection systems; certify operating personnel on the basis of training and supervision. Furthermore, the director of the department shall provide regulations regarding water supply production, treatment and distribution, and shall prescribe regulations regarding all aspects of bottled water, as well as ice production and sewage treatment. Finally, the director shall provide regulations to prevent pollution of any public swimming pool or bathing place. (Frank-Florida)
W76-12064

PUBLIC NATURE AND USE OF WATER (APPROPRIATION, BENEFICIAL USE, ADMINISTRATIVE REGULATION).
Ariz Rev Stat Ann secs 45-101 thru 45-109 (1956), as amended, (Supp 1975).

Descriptors: *Arizona, *Public rights, *Appropriation, *Beneficial use, Legislation, Consumptive use, Non-consumptive use, Competing uses, Water allocation(Policy), Water distribution(Applied), Distribution systems, State jurisdiction, Reservoir operation, Surface waters, Groundwater, Penalties(Legal)
Identifiers: Administrative regulations, Licenses, Water rights(Non-riparians).

Arizona has enacted legislation providing that the waters of all sources, flowing streams, underground channels, waste or surplus water, lakes, ponds and springs, belong to the public and are subject to appropriation. Beneficial use shall be the basis of the use of water appropriation rights shall lapse after five years of disuse. General control and supervision of waters is vested in the state land department, including appropriation and use control. The land department is authorized and directed to divide the state into water districts as necessity arises and to appoint a superintendent for each district. The superintendent is responsible for allocating water supply to reservoirs and ditches, controlling reservoirs in scarcity times, regulating distribution to users, and preventing excess use. Penalties are provided by statute for interfering with water allocation and control, using water without authorization, unauthorized diversion, water waste and storage of water without permit. (Comer-Florida)
W76-12065

APPROPRIATION OF WATER.
Ariz Rev Stat Ann secs 45-141 thru 45-155 (1956), as amended, (Supp 1975).

Descriptors: *Arizona, *Administrative agencies, *Appropriation, *Beneficial use, Legislation, Permits, Consumptive use, Non-consumptive use, Competing uses, Water allocation(Policy), State jurisdiction, Reservoir operation, Water permits, Administrative decisions.
Identifiers: Administrative regulations, Water rights(Non riparian), Licenses.

Arizona has enacted legislation providing that any person or political entity in the state may appropriate water for beneficial use, including domestic, municipal, irrigation, stock watering, power, wildlife, mining, recreation, personal and commercial use. As between claimants, the person first appropriating shall have the better right. Any one interceding to acquire a water right shall apply to the state land department, including all required information in the application. The department shall approve all proper applications unless the proposed use is detrimental to the interest, welfare and safety of the public, or unless the use conflicts with vested rights. Approval for less than the amount of water requested may be given for substantial reasons. As between conflicting applications where water supplies are insufficient to grant both, approval shall be given depending on relative values to public, with preference for domestic and municipal use first, irrigation and stock watering second, and power industry and mining third. Upon changes and large power plant uses require legislative approval. In addition to appropriation rights this chapter covers reservoir permits and interstate operations. (Comer-Florida)
W76-12066

RESERVOIRS AND CANALS.
Ariz Rev Stat Ann secs 45-201 thru 45-206 (1956), as amended, (Supp 1975).

Descriptors: *Arizona, *Reservoirs, *Canals, *Irrigation, *Construction, Irrigated land, Water supply, Eminent domain, Measurement, Reporting, Right-of-way, Penalties(Legal), Ditches, Irrigation canals, Irrigation operation and maintenance, Irrigation water.

Arizona has enacted legislation providing that owners of irrigable lands shall have the right to carry water to their lands through canals. One may obtain a right of way through another's land by condemnation under eminent domain. Further

ore, the right to open a fence in order to repair a ater ditch shall not be questioned; however, such ening shall be repaired, and the person responsi- may be liable for any unnecessary damage. The islation also provides for the installation of easuring devices on canals and reservoirs, as ll as on head gates. Violation of these require- nts shall be punished by closed ditches or ened reservoirs. In addition, one who controls a ans for carrying water and who lets disrepair luce the users' receivable flow shall be liable for repairs made after 6 days written notice. This ll be enforceable as a lien on the property. ally, widening of a ditch shall be permitted on payment of just compensation or damages to owner of land through which the ditch passes. ank-Florida)
6-12067

IAT CONSTITUTES LEGAL FENCE.
s Stat Ann sec 03.30.010 (1973).

scriptors: *Alaska, *Legislation, *Rivers, undaries(Property), *Water law, Barriers, al aspects, Bodies of water, Navigable rivers, igable waters, Running waters, Land tenure, arian lands, State jurisdiction, Structures.
ntifiers: *Natural fences, State policy.

laska a river constitutes a legal fence provided revents stock from crossing it. Another erion which determines whether a fence is legal eight; to be considered legal a fence must be at t four feet above the surface of the ground. al fences are divided into several categories: hose constructed of poles, rails, or boards ac- ing to certain specifications; (2) those con- cted of wires according to certain specifica- s; (3) worm fences or stone walls; (4) rivers, es, mountain ridges and bluffs; and (5) those tructed of woven wire according to certain ifications. (Cowart-Florida)
-12068

NENT DOMAIN (RIGHTS-OF-WAY).
Stat Ann sec 09.55.240 (1973), as amended, p 1974).

riptors: *Alaska, *Eminent domain, *Legal cts, *Public access, *Right-of-way, demnation, Streams, Channeling, Canals, nage, Sewers, Reservoirs, Water use, Treat- facilities, Public utilities, Public rights, mation.

a has enacted legislation providing that rights ninent domain may be exercised for public Such uses include: raising of streams; widen- deepening or channeling of water canals, s, ditches, pipes; wharves, docks, piers, s, ferries, bridges; draining and reclaiming of ; providing outlets for water flow or conduct ilings; and providing sewer lines. Eminent in powers may also be exercised for the loca- f pumping stations and reservoirs. All water or municipal purposes is declared to be a icial and a public use. (Frank-Florida)
12069

AND GAME CRITICAL HABITAT AREAS.
Stat Ann secs 16.20.220 thru 16.20.230 (1973), ended, (Supp 1974).

iptors: *Alaska, *Fishing, *Game birds, stocking, *Habitat improvement, *Habitats, life, Wildlife conservation, Wildlife manage- State governments, Legislation, Streams, ng, Conservation, Water conservation.

has enacted legislation establishing critical t areas for the protection of fish and game. areas are listed. Land in critical areas may sold or leased without notice to the commis- of fish and game. One may be required to full plans for development in such areas. A program of stocking with valuable game and fish is also established. (Frank-Florida)
W76-12070

STATE PARTICIPATION IN PORT FACILITIES AND DEVELOPMENT.
Alas Stat Ann secs 30.15.010 thru 30.15.080 (1975).

Descriptors: *Port authorities, *Alaska, *Harbors, *Construction, *Grants, State governments, Building, Ferryboats, Local governments, Financing, Legislation, Ships, Transportation, Naval architecture, Water structure.

Alaska has enacted legislation permitting grants to municipalities for port facilities construction. Eligibility requirements for the award of such grants are established. Special provision is made for the construction of combined port and ferry terminal facilities. In addition, a person may not leave a substantially wrecked vessel at any port, harbor, or upon public waters. Violations are subject to being fined and convicted of a misdemeanor. (Frank-Florida)
W76-12071

HYDROLOGICAL DATA--(COLLECTION, RECORDING DISTRIBUTION AND USE).
Alas Stat Ann secs 41.05.010 thru 41.05.030 (1971).

Descriptors: *Alaska, *Hydrologic data, *State governments, *Administrative agencies, *Surveys, Data collections, Measurement, Monitoring, Maps, Well data, Adoption of practices, Administrative decisions, Regulation.

By statute the State of Alaska has declared that systematic collection, recording, evaluation and distribution of all data on the location, quality, and quantity of waters within the State are in the public interest. The Department of Health and Social Services has the duty to collect and record all such data and to publish the same. It also has the duty to require that the results of surveys, pumping tests, flow measurements, physical characteristics and other data collection devices be filed and to enter into any agreements and expend such funds as are necessary. The Department is also empowered to adopt regulations relating to its duties. (Comer-Florida)
W76-12072

REGIONAL WATER DISTRIBUTION DISTRICTS.
Ark Stat Ann secs 21-1403 thru 21-1404 (Cum Supp 1975).

Descriptors: *Arkansas, *Water distribution(Applied), *Water districts, *Water management(Applied), *Water delivery, Legislation, Water control, Water conveyance, Water storage, Water supply, Water demand, Water transfer, Reservoirs, Legal aspects, Water treatment, Bodies of water, Water resources, Water requirements, Regulation, Administration, Zoning, Control systems.

Public regional water distribution districts may be organized in Arkansas for any of the following purposes: (1) the acquisition of water from wells, lakes, rivers, tributaries or streams of or bordering Arkansas, or from existing reservoirs; (2) the acquisition of water, water storage facilities, and the storage of such water in reservoirs; (3) the purification, treatment and processing of said water; (4) the furnishing of said water to persons desiring it; (5) assisting in the installation and operation of the water and transportation facilities; and (6) the transportation and delivery of said water. When water is available for industrial, municipal or agricultural purposes, then one hundred or more qualified voters residing or owning lands in the proposed water district may petition the circuit court in order to establish a water distribution district. The petition must include a description of the territory involved, a statement describing the source of the water, a statement of the necessity for the district, and other appropriate information. (Cowart-Florida)
W76-12073

ARKANSAS WATERWAYS COMMISSION (DUTIES).
Ark Stat Ann sec 21-1702 (Cum Supp 1975).

Descriptors: *Arkansas, *Legislation, *Conservation, *Water conservation, *Water law, State governments, State jurisdiction, Water resources, Surface waters, Water supply, Condemnation, Water policy, Water distribution, Rivers, Streams, Harbors.

The Arkansas Waterways Commission is given the duty and power to do the following: encourage the development of river port and harbor facilities; recommend recreational restrictions to expedite water transportation; collect tolls or user charges; acquire property by condemnation or purchase; require other agencies to coordinate efforts where waterway development is concerned; and represent the state in negotiations and planning with the Federal government. (Frank-Florida)
W76-12074

DOUNDOULAKIS V TOWN OF HEMPSTEAD (STRICT LIABILITY FOR DAMAGES CAUSED BY FILLING SWAMP RESULTING IN SUBTERRANEAN PERCOLATING WATERS DAMAGING ADJACENT PROPERTY).
381 NYS2d 287-98 (Sup Ct, App Div 1976). 12 p.

Descriptors: *New York, *Land fills, *Damages, *Percolating water, *Subsurface runoff, Groundwater movement, Induced infiltration, Land subsidence, Settlement(Structural), Land forming, Land use, Cities, Legal aspects.
Identifiers: *Absolute liability, *Notice, Fill permits.

Plaintiff landowners brought suit for damages against defendant township, consulting engineer and dredging company for property damage sustained as a result of landfill operations. The township had engaged in filling a swamp which adjoined plaintiffs' property. The method of fill, which involved use of pressurized water caused subterranean percolation of water which undermined plaintiffs' property. The trial court held the township liable, but dismissed the complaints against the other two defendants. On appeal, the Appellate Division held that the township was strictly liable without regard to fault for damage resulting from landfill operations. The appellate court also found that the complaints against the other two defendants were improperly dismissed and that the consulting engineer and dredging company were jointly liable with the township. With regard to timeliness of claims filed by the plaintiffs, the court stated that when the plaintiffs promptly notified the town of danger resulting from the operation, failure to file formal notice of claim until actual damage resulted two years later did not prejudice township's rights or basis for dismissal. (Comer-Florida)
W76-12075

BOYER V DEPARTMENT OF HEALTH (THE LATITUDE OF COUNTY REGULATIONS IN REGARD TO WATER PURITY).
381 NYS2d 805-08 (Sup Ct, App Div 1976). 4 p.

Descriptors: *New York, *Water wells, *Septic tanks, *Path of pollutants, *Waste dilution, Sewage disposal, Water levels, Water quality control, Public health, Potable water, Sanitary engineering, Well regulations, Legislation, Water quality standards, Waste water treatment, Water purification, Judicial decisions.
Identifiers: Administrative regulations, Licenses, Water rights(Non riparian).

Plaintiff landowner brought action to vacate approval and certification of a septic system located on neighboring property and to vacate a certificate of occupancy granted to an adjacent property owner. The defendants were the county Department of Health and town Superintendent of Buildings. Plaintiff's property was served by two wells. When the owner of the adjacent property installed a septic system, the distance of the leach field was 84 feet from one of plaintiff's wells. Plaintiff asserted that approval of the septic system was in violation of the state Sanitary Code, which recommends that leach fields be located at least 100 feet from any well. Defendants maintained that the Sanitary Code is not mandatory and that in the area concerned the Code could not be complied with because of local conditions. The trial court dismissed the complaint and the appellate court affirmed, stating that the Sanitary Code recommendations were not mandatory because the code indicates only that the leach field 'should be' 100 feet from wells. The county health departments are given flexibility under the code to deal with local complexities. (Comer-Florida)
W76-12076

KRAVEC V STATE (BRIDGING OF STATE DRAINAGE DITCH TO OBTAIN ACCESS TO INTERIOR LANDS).
382 NYS2d 181-85 (Sup Ct App Div 1976). 5 p.

Descriptors: *New York, *Easements, *Drainage systems, *Right-of-way, *Access routes, Ditches, Bridges, Boundaries(Property), Real property, Condemnation, Eminent domain, Legal aspects, Land tenure.

Plaintiff landowners brought suit for damages claiming that a state drainage easement appropriation denied them access to their land. The land in question was bordered by a prior easement granted to the county and by other lands, not owned by plaintiffs situated on all sides except the side on which the state appropriation was made. The trial court held that while the plaintiffs were barred from access across the county easement, the state drainage easement did not bar access by way of bridge. The Appellate Division court affirmed. The county easement, granted by plaintiffs predecessor, never reserved any property owner rights in the granting instrument and so did not allow access. The state easement, however, reserved the owners' rights to use the property in any way not interfering with easement use. Since the easement appropriation was made for drainage purposes only, the building of a bridge over the drainage ditch to allow access to the property was allowable. (Comer-Florida)
W76-12077

COMMONWEALTH DEPT OF ENVIRONMENTAL RESOURCES V BIERMAN (WATER PERMITS AND FLUORIDATION OF WATER).
354 A2d 48-52 (Pa Com Ct 1976). 5 p.

Descriptors: *Pennsylvania, *Fluoridation, *Fluorides, *Public health, *Administrative decisions, Administrative agencies, Water treatment, Water users, Consumptive use, Domestic water, Potable water, Judicial decisions, Legal review, Environmental effects.
Identifiers: *Environmental impact statement.

Plaintiff residents of town appealed from an Environmental Hearing Board decision to fluoridate town water. The appellate court affirmed the order of the agency, finding that the order was entered on the basis of substantial evidence. The court determined that no legal authority was presented that compelled the board to require an environmental impact statement. With regard to evidence presented at the public hearing, the court determined that the board acted properly in allowing a biochemist to testify to his own research results but erred in admitting certain other evidence. With regard to the effect of other pending actions by the plaintiffs the court determined that the other pending actions were without relevance to the issue of whether the water supply permit should be issued. (Comer-Florida)
W76-12078

UNITED STATES V CITY OF MC ALESTER (AUTHORIZED USE OF LEASED WATERSHED EASEMENTS).
410 F Supp 848-61 (ED Okla. 1976) 14 p.

Descriptors: *Oklahoma, *Indian reservations, *Eminent domain, *Federal jurisdiction, *Easements, Watersheds(Basins), Water works, Reasonable use, Judicial decisions, Land use, Parks, Ranges, Recreation, Crop production, Land tenure, Real property, Legal aspects.

The United States, as trustee of the Choctaw-Chickasaw Nations, brought this action against defendant city to quiet title to certain lands owned by the Indian Nations. By eminent domain proceedings in 1903 the city had acquired an easement over certain lands owned by the Choctaw-Chickasaw Nations. The easement, obtained for purposes of a watershed basin and to erect and maintain a waterworks for city use, was obtained without joining the United States as a party. The Federal District Court held that even though the United States was an indispensable party to the proceedings, the eminent domain action was within the power of the city and resulted in a valid easement. In addition, the court found that the actions of the city in leasing sections of the easement area to utility companies and private individuals were not inconsistent with the easement rights and were authorized uses. (Comer-Florida)
W76-12079

DUCK RIVER PRESERVATION ASSOCIATION V TVA (ENVIRONMENTAL IMPACT STATEMENTS AND USE OF THE RIVER).
410 F Supp 758-68 (ED Tenn 1974). 11 p.

Descriptors: *Tennessee Valley Authority, *Dam construction, *Reservoir sites, *Damsites, *Environmental effects, Mollusks, Cultivated lands, Wildlife habitats, Wildlife conservation, Vegetation effects, Balance of nature, Fish management, Population, Water injury, Psychological aspects, Recreation.
Identifiers: *National Environmental Policy Act, *Environmental impact statements.

Plaintiff conservation association brought action to enjoin construction of a dam and reservoir on the Duck River. The plaintiff alleged insufficient treatment of the effect of the project on agriculture, wildlife, recreation and family relocation in the required environmental impact statement (EIS). The trial court granted the injunction. Although the EIS was sufficiently detailed in most respects and represented a good faith effort, defendant Tennessee Valley Authority failed to disclose the possible extinction of a mollusks species as a result of the dam. In addition the EIS should have revealed the unavoidable losses in agricultural production; offsetting economic industrial development statements were not justification for avoidance. Relocation of families costs, the question of whether a wildlife preserve to protect displaced wildlife would be established, and the fact that recreational demand would exceed opportunities by the year 2000 were other required but omitted issues. In later proceedings the court reviewed an amended EIS submitted by the authority and declared the EIS sufficiently detailed in all areas. The injunction was then withdrawn. (Comer-Florida)
W76-12080

CITIZENS TO SAVE OUR LAND V MCKEE CREEK WATERSHED CONSERV DIST (RIVER CONSERVANCY DISTRICT ACT NOT UNCONSTITUTIONAL DELEGATION OF LEGISLATIVE FUNCTION).
347 N.E.2d 41-8 (Ill App Ct 1975). 8 p.

Descriptors: *Illinois, *Water districts, *Legal aspects, *Legal review, *Judicial decisions, Assessments, Financing, Taxes, Legislation, Districts, Local governments, State governments, Water law, Constitutional law.
Identifiers: *Injunctive relief, Notice.

Plaintiff environmental group joined with land owners to contend that the Illinois River Conservancy District Act was unconstitutional because it provides for the appointment rather than popular election, of the trustees of a river conservancy district. The court disagreed, saying that the defendant Water District is a special unit of government whose trustees perform essentially nonlegislative functions, and therefore can be appointed. The court also refused the plaintiffs' contention that the role of the court in determining boundaries for the district violated the doctrine of separation of powers. After holding that the District had statutory authority to make local improvements by special assessment, the court denied plaintiffs' right to injunctive relief. (Frank-Florida)
W76-12081

VILLAGE SAFE WATER ACT.
Alas Stat Ann secs 46.07.030 thru 46.07.080 (Supp 1975).

Descriptors: *Potable water, *Facilities, *Water pollution control, *Alaska, *Local governments, Administration, Governments, Construction, Regulation, Pollution abatement, Management, Inter-agency cooperation, Planning, Environmental effects, Legislation.

The location of a new facility under the Village Safe Water Act shall be determined by the commissioner of environmental conservation in consultation with the governing body of the village where construction is proposed. Public agencies, including the Alaska State Housing Authority, shall also be consulted. The aim is to promote coordination in local development plans affecting the community. Specific regulations cover size of villages subject to this provision. (Frank-Florida)
W76-12082

BD OF TRUSTEES OF INTERNAL IMPROVEMENT TRUST FUND V BANKERS LIFE AND CAS CO (OWNERS RIGHTS TO FILL AREA BETWEEN OCEAN'S HIGH WATER MARK AND BULKHEAD LINE).
331 So2d 381-5 (1st DCA Fla. 1976). 5 p.

Descriptors: *Boundaries(Property), *Florida, *Landfills, *High water mark, *Bulkhead line, Land, Land use, Land development, Navigable waters, Bulkheads, Coastal structures, Legal aspects, Riparian rights, Water law, Ownership of beds, Beds, State governments, Decision-making, Adjacent land owners, Boundary disputes, Public rights.
Identifiers: Fill permits.

Plaintiff owner of land situated between Lake Worth and the Atlantic Ocean desired to fill and eventually to sell the area between the ordinary high water mark and the bulkhead line established opposite his lands. The plaintiff sought an adjudication of its rights with respect to such filling. The Circuit Court held that such filling was permissible, and defendant trustees appealed. Under the common law the title to the bottoms of all navigable waters was vested in the sovereign. The Butler Act of 1921 divested the state of rights, title and interest to lands covered by water, and operated to vest title to the land created by the lawful filling of such bottoms in the riparian proprietors when the filling was accomplished. In 1957 it became necessary to withdraw the blanket right of uplan

wners to acquire title to adjoining bottoms. How-
ver, the Butler Act remained in force as to those
nds which came within certain conditions. The
irst District Court of Appeal thus concluded that
ie bottoms here involved fell within the condi-
ons; therefore, the plaintiff had the right to make
ie desired fill and thereby acquire title to the
lled land. (Cowart-Florida)
76-12083

ONSTRUCTION OF WATERWORKS.
yo Const art 16 sec 10 (1959).

escriptors: *Wyoming, *Water utilization, Water conservation, *Water manage-
ent(Applied), *Legislation, Soil conservation, gal aspects, State governments, Water distribu-
n(Applied), Water policy, Water resources, ater supply, Water works, Water districts, Ir-
ation, Irrigation districts, Drainage districts, nstruction, State jurisdiction, Hydroelectric wer, Water resources development.

e legislature of the state of Wyoming shall have power to provide for the construction or im-
vement of any works designed, constructed or erated for the purposes of conservation or ization of water. The legislature may so provide ectly or by extending aid to legal sub-divisions the state, or to duly organized irrigation, inage, soil conservation, public irrigation and ver districts, or to any public corporation lly organized for the purposes of conservation, ribution or utilization of water or soil. The visions of the Wyoming constitution which hibit the state from engaging in works of inter-improvement unless authorized by a two-thirds of the people shall not apply to works gned for the conservation or utilization of er. (Cowart-Florida)
-12084

TRICTIONS ON DAMMING STREAMS.
Stat Ann sec 24-16 (Supp 1971).

criptors: *Wyoming, *Dams, *State jurisdic-
*Overflow, *Banks, Water levels, Streams, hes, Irrigation ditches, Canals, Regulation, slation, Legal aspects, Waste r(Pollution), Flow, Water control, Water pol-Water management(Applied), Embankments, ges, Roads, Highways, Water law.

state of Wyoming has placed restrictions on damming of streams, irrigation or mining es, or any water way in the state. No person rsons, company or corporation, or associa-of persons shall be permitted to dam any way so that the water thus dammed over-any public road or undermines, weakens or ges any bridge, or any walls or embankment road. Persons, associations or corporations ng or controlling ditches or irrigated lands not allow any waste water to flow across or any public road. (Cowart-Florida)
12085

SDICTION OVER RIVERS.
Code Ann sec 1-1-2 (1971).

iptors: *West Virginia, *State jurisdiction, River, *Rivers, Legal aspects, Legislation, ng waters, River beds, Banks, Water law, an rights, Ownership of beds, Shores, Boun-(Property), State governments, Jurisdiction, rights, Public rights, Preferences(Water , Water, Water policy.

risdiction of the state of West Virginia ex-over all the rivers which are boundaries en that state and any other state. This ju-on extends to the opposite (western) shore Ohio River. Riparian owners of land on the iver, as against the State of West Virginia, heir titles only to the ordinary high water mark. The beds and banks of the Ohio River are held by the State of West Virginia in trust for the public. (Cowart-Florida)
W76-12086

DAMS OR OBSTRUCTIONS IN WATERCOURSES.
W Va Code Ann sec 61-3-47 (Supp 1975).

Descriptors: *West Virginia, *Dams, *Fish ladders, *Structures, *Legislation, Legal aspects, Planning, Water law, Jurisdiction, Regulation, Streams, Fish management, Bodies of water, Running water, Rivers, Streamflow, Fish passages, Fish migration, Water policy, Wildlife management, Lumber, Lumbering.

The state of West Virginia prohibits the obstruction of its watercourses by means of a dam or other structure, or by means of felled timber. No person shall fell timber and permit it to remain in a navigable or floatable stream if it obstructs the passage of boats, staves, rafts, ties or timber of any kind. Neither shall any person construct or maintain a dam or other structure in any stream or watercourse if it obstructs the free passage of fish. A suitable fish ladder, way or flume constructed to allow fish to easily ascend or descend must be provided as part of any dam or structure. The director of the department of natural resources must approve the plans for any such fish ladder. If, however, the director determines that there is no substantial fish life in the stream or watercourse, or that installation of the ladder is impracticable, he may permit construction of a dam or other structure without a fish ladder. (Cowart-Florida)
W76-12087

ANCHORAGE OF HOUSEBOATS.
Conn Gen Stat Ann secs 19-101 thru 19-103 (1969).

Descriptors: *Connecticut, *Barges, *Boats, *Water law, *Legislation, Navigable waters, Beaches, Rivers, Anchors, Transportation, Harbors, Ships, Administrative decisions, Adoption of practices, Penalties(Legal).
Identifiers: *Houseboats.

Connecticut has enacted legislation providing that the local director of health may set limits in waters adjacent to any beach within which houseboats or other vessels shall not be permitted to rest at anchor. If five or more people request such limits, he must set them. The penalty for violation of this statute is a fine of fifty dollars or thirty days in jail for each day of illegal anchorage. Appeal shall be taken within 48 hours to the Commissioner of Health. (Frank-Florida)
W76-12088

OBSTRUCTION TO NAVIGATION OR PUBLIC USE OF WATERS PROHIBITED.
Conn Gen Stat Ann sec 15-140d (Cum Supp 1976).

Descriptors: *Connecticut, *Obstruction to flow, *Water users, *Navigation, Ships, Rivers, Streams, Navigable rivers, Navigable waters, Structures, State governments, Legislation.
Identifiers: *Navigation obstructions.

In Connecticut, no vessel or structure may be placed on the state's waters if it constitutes a hindrance to navigation, public use, or the environment. The commissioner of transportation or environmental protection may order any obstruction removed or dismantled. (Frank-Florida)
W76-12089

MUNICIPAL SEWERAGE SYSTEMS (POWERS).

Descriptors: *Treatment facilities, *Connecticut, *Sewage districts, *Legislation, *Sewage treatment, Sewerage, Sewage, Local governments, Water pollution, Water pollution control, Water pollution treatment, Contracts, Disposal, Waste disposal, Sewers, Wastes.

Connecticut has enacted legislation providing that any municipality may by ordinance create its own sewer authority. A sewer authority so created shall have power to: acquire, construct and operate a system; purchase or condemn land; pass rules for control and operation of the system, including discharge and storm water runoff; and contract with any municipality to provide or obtain sewerage service. (Frank-Florida)
W76-12090

LOWER CONNECTICUT RIVER CONSERVATION ZONE.
Conn Gen Stat Ann secs 25-102 a thru 25-102 K (1975), as amended, (Supp 1976).

Descriptors: *River basin commissions, *Connecticut, *Connecticut River, *Preservation, *Administrative agencies, Rivers, Running waters, Conservation, Water conservation, Soil conservation, Protection, Natural resources, Legal aspects, Legislation, Zoning, Regulation, Control, Management, Estuaries, Streams, Ecology, Scenic easements, Aesthetics, Water law, Social aspects.

The commissioner of environmental protection, who is generally responsible for preserving the natural resources of the state of Connecticut, is specifically empowered to preserve the scenic, ecological, scientific and historical values of the lower Connecticut River and the towns abutting, and to prevent deterioration of the natural and traditional riverways of the state. In order to effectuate these goals the area to be included in a conservation zone is specified, and a Connecticut River Gateway Commission is established. The commission shall develop minimum standards for preserving the lands and waters in an area by regulating the means of land coverage, frontage, setback, design and building height, the cutting of timber, burning of undergrowth, removal of soil or other earth materials, and the dumping or storing of refuse. The commissioner shall acquire, in the name of the state, interests in lands and waters including scenic easements and development rights. Local planning and zoning commissions with the conservation zone shall revise their ordinances to meet the minimum standards established by the commission. (Cowart-Florida)
W76-12091

DETERGENTS (RESTRICTIONS ON SALE OR USE).
Conn. Gen. Stat. Ann. secs 25-54nn through 25-34pp (1975).

Descriptors: *Phosphates, *Connecticut, *Water pollution control, *Detergents, *Phosphorus, Water pollution, Water quality, Water quality control, Abatement, Water, Water pollution sources, Pollution abatement, Legislation, Legal aspects, Chemicals, Soaps, Phosphorus compounds, Cleaning, Foaming, Water softening, Dyes, Enzymes.

Connecticut has enacted legislation providing that no person, firm or corporation shall sell, give or furnish any synthetic detergent or detergent in any form in the state after February 1, 1972, unless the packaging is clearly labeled with respect to its polyphosphate builder or phosphorus ingredient content. In addition, after October 1, 1974, any person or entity selling, giving or furnishing detergent must file with the commissioner of environmental protection a written statement setting forth the chemical and common names of all ingredients. The commissioner may ban or restrict the sale or use of any detergent in order to protect the waters of the state. Specific prohibitions on the sale of detergents whose phosphorus content exceeds 8.7% are set forth, and certain medical,

scientific and industrial uses are exempted from the prohibition. (Cowart-Florida)
W76-12092

POWERS, RIGHTS AND DUTIES OF CORPORATIONS.
Ala Code tit 10 secs 71 thru 82 (Cum Supp 1973).

Descriptors: *Alabama, *Water works, *Eminent domain, *Right-of-way, *Legislation, State governments, Legal aspects, Bridges, Piers, Structures.

Alabama corporations formed to construct or operate internal improvement works or public utilities are authorized by statute to exercise eminent domain powers. Corporations authorized include electric works, power companies and entities engaged in operation or construction of bridges, viaducts, wharves, or piers. These corporations may enter and survey property, land and water, but they are liable for any resulting damages. Any such surveys and examinations undertaken may not impede navigation on navigable streams. The statute also provides that rights of way may be acquired by condemnation. (Comer-Florida)
W76-12093

PUBLIC WATER SUPPLY SYSTEMS AND WASTEWATER TREATMENT PLANTS.
Ala Code tit 22 secs 140(30) thru 140(45) (Cum Supp 1973).

Descriptors: *Alabama, *Water quality standards, *Water works, *Waste water treatment, *Permits, Legislation, State governments, Administrative agencies, Water quality control, Water resources, Treatment facilities, Standards.
Identifiers: *Licenses, *Certification.

By statute, all Alabama water treatment plants and wastewater distribution treatment plants and water distribution systems are classified by the state health officer. Bases of classification are size, type, character of water treated and the skill and experience that a plant operator must exercise. Persons who supervise the operations of treatment plants and distribution systems must be certified by the state health officer in conjunction with an appointed certification board. Certification is available for a five year term with a renewal allowance. Certificates may be revoked after hearing for fraud in obtaining the certificate, failure to use reasonable care or judgment in operation, and incompetence. Operation of any water treatment plant, water distribution system or wastewater treatment plant without certification is a misdemeanor, punishable by fine or imprisonment. (Comer-Florida)
W76-12094

ELK RIVER DEVELOPMENT AGENCY.
Ala. Code tit 38 secs 131 thru 140 (Cum Supp 1973).

Descriptors: *Alabama, *Legislation, *Groundwater, Basins, *River basin development, *Comprehensive planning, River basin commissions, Watershed management, State governments, Administrative agencies, Water resources development, Water policy, Natural resources, Subsurface waters, Surface waters, Land resources, Water supply development.
Identifiers: *Elk River(Ala).

In order to provide for uniform development of the Alabama portion of the Elk River and to coordinate development of the watershed area with agencies of other states, the Alabama legislature has created the Elk River development agency. The agency shall be a public corporation, incorporated under state law, the members of which shall be appointed by the governor. The agency shall be empowered to: formulate and execute development plans for the area; to acquire land by purchases, lease, gift, condemnation or other means; to enter into contracts for sale of water; to develop reservoirs and shoreline lands for recreational purposes; to sell or lease shoreline lands; and to issue bonds to finance its activities. The agency shall be exempt from state taxation and shall report annually to the governor. (Comer-Florida)
W76-12095

RECORDING OF AERIAL PHOTOGRAPHS OR MAPS.
Ala Code tit 56 secs 42 thru 44 (Cum Supp 1973).

Descriptors: *Watershed management, *Alabama, *Aerial photography, *Maps, *Locating, Sites, Surveys, Terrain analysis, Topography, State governments, High water mark, Water storage.

Alabama probate judges are instructed by statute to receive and record aerial photographs and maps for the purpose of facilitating acquirement of easements by watershed associations, water conservation associations or districts, and any other entity engaged in soil or water conservation. The photographs and maps may have the origin, scale, section and township lines, property lines, high water marks and water storage areas inscribed on them before recording. Irrespective of this election, the photographs and maps must be approved and signed by the county engineer of the area represented before recording. After recording, the photographs and maps may be used as references in instruments of conveyance. (Comer-Florida)
W76-12096

DEVELOPMENT OF BEAR CREEK WATERSHED AREA.
Ala Const amend 247.

Descriptors: *Alabama, *River basin development, *Watersheds(Basins), *Legislation, *Watershed management, Water conservation, Water utilization, Land use, State governments, Irrigation programs, Industries, Social aspects, Eminent domain, Condemnation, Bond issues, Recreation, Regional development, Water resources development, Regional economics, Cities, Electric power production, Navigation, Water supply, Flood control.
Identifiers: Public corporations, *Bear Creek watershed(Ala).

The Alabama legislature may authorize formation of a public corporation to develop the Bear Creek watershed for the purposes of navigation, water conservation and supply, flood control, irrigation, industrial development, public recreation and other related purposes. The counties and municipalities within the watershed may contribute public funds to the corporation. The corporation may be granted all powers and privileges necessary for full development of the watershed, including the power of condemnation and the power to issue revenue bonds. The corporation may not be authorized to engage in the production, transmission or sale of electric power. (Capehart-Florida)
W76-12097

WATER MANAGEMENT DISTRICTS.
Ala Const amend 257.

Descriptors: *Alabama, *Drainage areas, *Flood protection, *Water management(Applied), *Eminent domain, Taxes, Assessments, Electric power production, Hydroelectric power, Wetlands, Drainage, Swamps, State governments, Flood control, Legislation, Drainage systems, Water conservation, Water resources, Water utilization, Land reclamation, Drainage districts, Governments drainage programs, Operating costs.

Alabama has enacted legislation providing that water management districts may be formed to establish improvements for the drainage of wetlands and for flood prevention and control of water within the state. Such districts may be given the power of eminent domain and the power to tax the lands and property within their jurisdiction for the cost of the improvements. No district, however, shall engage in the production, transmission or sale of electric power either directly or indirectly. (Capehart-Florida)
W76-12098

WORKS OF INTERNAL IMPROVEMENT ALONG NAVIGABLE WATERWAYS.
Ala Const amend 275.

Descriptors: *Alabama, *Facilities, *Inland waterways, *Operation and maintenance, Resources development, State governments, Legislation, Bond issues, Docks, Structures, Construction, Financing, Legal aspects, Economics, Costs

Alabama has enacted legislation providing that the state may construct and operate elevators, warehouses, docks, water and rail terminals, and other facilities along navigable streams and waterways to promote the flow of agricultural products within the state and to aid commerce and the use of waterways. Such facilities shall always remain under the control of the state and be part of the state inland waterways facilities. The state may become indebted up to $2,000,000 for these purposes and may issue bonds for repayment of such indebtedness. (Capehart-Florida)
W76-12099

NAVIGABLE WATERWAY BETWEEN MONTGOMERY AND GADSEN AND TO THE ALABAMA-GEORGIA BOUNDARY.
Ala Const amend 287.

Descriptors: *Alabama, *Navigable waters, *Channels, *Legislation, *Inland waterways, Construction, Structures, Hydroelectric plants, Legal aspects, Bond issues, Economics, Financing, Governmental interrelations, Costs, Governments, State governments.
Identifiers: Public corporations.

If authorized by the legislature, the state of Alabama may engage in internal improvement works in connection with construction and maintenance of a navigable waterway between Montgomery and Gadsden and to the Alabama-Georgia boundary. The state may issue bonds in connection with the project and may make appropriation from the state general fund. The state may also establish a public corporation to undertake the waterway project, although such corporation shall not be authorized to acquire a hydroelectric project through any means. (Capehart-Florida)
W76-12100

WORKS OF INTERNAL IMPROVEMENT ALONG NAVIGABLE WATERWAYS.
Ala Const amend 288.

Descriptors: *Construction, *Alabama, *Navigable rivers, *Navigable waters, Piers, Bridges, Docks, Levees, Buildings, Water resources development, State governments, Administrative agencies, Legislation, Cost allocation

When authorized by legislation, the state of Alabama may engage in public improvement works of construction and operation of warehouses, water and rail terminals and other structures and facilities along navigable streams and waterways. The facilities must always be and remain within the management and control of the state and will become a part of the inland waterway facilities. Maximum cost for such facilities under constitutional provisions, is ten million dollars. Bonds may be issued to provide necessary funds. (Comer-Florida)
W76-12101

ATER USE ACT.
as Stat Ann secs 46.15.010 thru 46.15.270 (1962).

escriptors: *Alaska, *Water utilization, *Water ocation(Policy), *Preferences(Water rights), Vater permits, Appropriation, Administrative encies, Permits, Penalties(Legal), Legislation, neficial use, Water resources, Natural ources, Public rights, Regulation, Water de- nd, Water supply, State governments, Law en- cement, Water works, Municipal water, Com- ing uses, Public health.

ska has vested authority in the Department of tural Resources to determine and adjudicate er rights and the appropriation and distribution the waters of the state. To implement this iority, a permit is required to obtain a right to ropriate water. The criteria used to determine ance of a permit are specified. Preference in ting permits for competing uses of the same er source is given first to public water supplies then to the uses considered most beneficial. ropriations are subject to abandonment, for- ire and reversion. A water right is appurtenant e land and passes with conveyance of the land ss specifically exempted. A water right exist- prior to July 1, 1966 is a lawful appropriation. inal penalties are attached to the thorized use or misuse of water. Finally, a er Resources Board is created to advise and m the governor on matters pertaining to the nd appropriation of water. (Capehart-Florida) -12102

ER POLLUTION--BOAT TOILET LAW.
Op Att'y Gen Wisconsin 167-72. 6 p.

riptors: *Wisconsin, *State jurisdiction, age disposal, *Boating regulations, rstate rivers, Mississippi River, Legal ts, Boundaries(Property), Organic wastes, onmental sanitation, Waste water disposal, r pollution sources, Waste disposal, Water Water quality.
fiers: *Marine toilets, Comparative law, guous zone, River boundaries, Enforcement.

the Mississippi River is clearly an inland of Wisconsin as statutorily defined, the Boat Law may be enforced on the entire width of ississippi bordering Minnesota and up to the of the main channel bordering Iowa. As a l proposition, Wisconsin can enforce its p to the center of the channel of the Missis- River. If the act prohibited is 'malum in se', nsin may enforce the law the entire width of er. If, however, the act forbidden is merely n prohibitum', Wisconsin may enforce the ly up to the center of the channel. In cases bordering states have similar laws classified la prohibita', the law of each may be en- the entire width of the river. A law requir- installation of holding tanks on boats for l of wastes on shore is 'mala prohibita', not e it is inherently wrong but because it is ted. Minnesota recently amended its law so is now substantially similar to Wisconsin us, both may be enforced the entire width iver. (Reinders-Florida)
-103

IPALITIES--AUTHORITY TO CHARGE FOR ADMISSION TO MUNICIPAL
y Gen Fla 075-84 (1975). 3 p.

tors: *Florida, *Beaches, *Governmental tions, *Recreational facilities, *Parks, e, Recreation, Local governments, Legal Jurisdiction, Political aspects, Planning, on, Water policy, Management, Control, al use, Municipal water, Riparian rights, propriation, Water rights, Reservation

rs: Water rights(Non riparian), Public trine.

The Attorney General of Florida has stated that municipalities in Florida may charge a fee for admission to a municipal beach. Municipalities have ample authority for acquiring land for park purposes. Furthermore, they may set apart for recreation purposes any municipally owned lands not dedicated or devoted to other inconsistent public uses. It has long been held that the authority to maintain a park carries with it the power to maintain a bathing beach. A municipality may make all reasonable and nondiscriminatory regulations with regard to the control and management of its public parks as are necessary to preserve the public peace and safety, the protection of the property from injury, and to secure to the public the common enjoyment thereof. Therefore, it is generally recognized that a municipality may demand a fee for individual use, provided such fee is reasonable and nondiscriminatory. This authority applies only to municipally owned beaches. Wet-sand beaches between the mean high and mean low water lines are owned by the State and held in trust for all the people. As such, public admission and use of these beaches, in the absence of legislative direction to the contrary, are not subject to municipal regulation and control. (Reinders-Florida)
W76-12104

OIL SPILL PREVENTION AND POLLUTION CONTROL ACT.
1973 Fla Att'y Gen Ann Rep 730-31. 2 p.

Descriptors: *Florida, Pollutant identification, *Federal Water Pollution Control Act, *Oil spills, *Hazards, Legislation, Statutes, Legal aspects, Water law, Water pollution, Chemical wastes, Inorganic compounds, Oil wastes, Beaches, Public health, Safety, Water pollution sources, Water pollution effects, Environmental effects.
Identifiers: *Coastal waters, *Hazardous substances, *Oil Pollution Act.

The Attorney General of Florida has determined that the statutory language 'other hazardous materials' of section 376.031(7), F. S., defining pollutants does not limit the application of the Oil Spill Prevention and Pollution Control Act to oil, gasoline, pesticides, ammonia, chlorine, or their derivatives and by-products. The term 'hazardous materials', in accord with the definition of 'hazardous substances' presented in the Federal Water Pollution Control Act, includes elements or compounds which when discharged in any quantity present an imminent and substantial danger to the public health or welfare. 'Public welfare' includes, but is not limited to, fish, shellfish, wildlife, shorelines, and beaches. As of November, 1973, the Florida Department of Natural Resources has not interpreted the statute regarding the definition of pollutants or hazardous substances. (Reinders-Florida)
W76-12105

BANKERS LIFE AND CASUALTY COMPANY V CALLAWAY (EXTENSION CRITERIA FOR DREDGE AND FILL PERMITS UNDER THE RIVERS AND HARBORS ACT).
530 F2d 625-36 (5th Cir 1976). 12 p.

Descriptors: *Permits, *Dredging, *Administrative decisions, *Florida, Regulation, Rivers and Harbors Act, Conservation, Ecology, Legal review, Administrative agencies, Control, Local governments, Lake basins, Legal aspects.
Identifiers: *Fill permits.

Plaintiff dredging company sought a declaration that defendant Army Corps of Engineers had unreasonably delayed extension of the company's dredge and fill permit, that the permit never expired, and that hearing on the renewal application should have been granted. The plaintiff's original permit was extended; however, the defendant refused a second extension. In addition, the defendant had required a local fill permit in accordance with Florida law. This the plaintiff had also failed to procure. The plaintiff relied on section 558(c) of the Administrative Procedures Act (APA) which states that a license for continuing activity does not expire until a final ruling. After a lower court dismissed the suit as unripe, the court of appeals reversed, holding that the defendant was correct in waiting for the local permit to be approved before granting renewal. Furthermore, plaintiff's permit by its language had expired. The court then went on to rule that a renewal hearing will be granted only after a sanction has been placed on the licensee. (Frank-Florida)
W76-12106

ENVIRONMENTAL CONSERVATION (WATER POLLUTION CONTROL).
Alas Stat Ann secs 46.03.010 thru 46.03.710 thru 46.03.130, 46.03.710 thru 46.03.900 (1971), as amended, (Supp 1975).

Descriptors: *Alaska, *Legislation, *Administrative agencies, *Water quality standards, *Water resources development, Water quality control, Pollution abatement, Water pollution control, Water policy, Waste water disposal, Permits, Oil pollution, Pesticide removal, Air pollution.
Identifiers: Administrative regulations, Nuisance(Legal aspects).

To carry out state policy in the protection, improvement and conservation of natural resources, the Department of Environmental Conservation is empowered with all necessary powers to formulate and annually review a statewide environmental plan for the management and protection of the environment. With specific reference to water pollution control the department has the jurisdiction to prevent and abate pollution. The department shall develop a comprehensive plan for water pollution control and, after public hearing, may adopt and publish water quality standards, and pollution standards. The department may require submission of plans for sewage and industrial waste disposal or treatment. No disposal of solid or liquid commercial waste may be made without a permit obtained from the department in accordance with specified procedure. The department may also terminate or modify permits for proper reasons and may issue compliance orders. penalties are provided for certain prohibited actions, including oil pollution, ballast water discharge, use of certain pesticides and construction of certain sewage plants. (Comer-Florida)
W76-12107

UNITED STATES V KENNEBEC LOG DRIVING COMPANY (RIVER AND HARBORS ACT APPLICABLE TO LOG DRIVING ACTIVITY).
530 F2d 446-50 (1st Cir 1976). 5 p.

Descriptors: *Maine, *Rivers and Harbors Act, *Lumbering, *Wood wastes, *Pollutants, *Permits, Rivers, Legislation, Water pollution, Legal aspects, Control, Bark, Waste disposal, Disposal, Water pollution sources, Judicial decisions.
Identifiers: *Injunctive relief, Kennebec River(Me).

Plaintiff United States sought an injunction against defendant log drivers to stop future log driving, as well as an order requiring removal of past log refuse from the Kennebec River. The defendants said that section 13 of the Rivers and Harbors Act did not apply to them, and that enforcement was within the discretion of the Secretary of the Army. The District Court held that peeled bark and logs were forbidden refuse under the Act. On appeal the First Circuit Court held that the Act applies to log driving, and that refuse discharge permits must be obtained before such activities may be conducted. It further affirmed the District Court in saying that section 13 did not apply only to refuse affecting navigation. The issue of retrospective relief was remanded to the

District Court, as defendants claimed there should be no clean-up responsibilities for actions taken under a good faith construction of the law. (Frank-Florida)
W76-12108

GRAIN PROCESSING CORP V TRAIN (SINGLE NUMBER EFFLUENT STANDARD AS ARBITRARY--MUST HAVE A RANGE OF NUMBERS).
407 F Supp 96-107 (SD Iowa 1976). 12 p, 2 tab.

Descriptors: *Administrative decisions, *Water quality standards, Biochemical oxygen demand, Suspended solids, Hydrogen ion concentration, *Federal Water Pollution Control Act, Effluents, Industrial wastes, Water pollution control, Water pollution sources, Water quality, Mills, Water policy, Permits, Regulation, Administrative agencies, *Iowa.
Identifiers: *FWPCA Amendments of 1972, *Administrative regulations, *Effluent limitations.

Plaintiffs, millers in the corn wet milling industry, brought this action to review effluent limitation guidelines promulgated by the Environmental Protection Agency (EPA). The plaintiffs alleged that regulations for existing point sources in the industry were promulgated beyond the statutory authority granted the EPA and that the EPA acted arbitrarily and capriciously in promulgation. The Federal District Court held for the plaintiffs. The court found that in issuing effluent limitation guidelines the EPA reasonably divided grain milling into six subcategories; however, the EPA did not satisfy section 304(b)(1)(B) of the Federal Water Pollution Control Act amendments which requires that the EPA specify factors to be taken into account when promulgating guidelines. The EPA was therefore found to have acted arbitrarily and capriciously and in excess of statutory authority in failing to specify point source factors. In addition, the EPA guidelines, being single number, rather than range, were held to be invalid since they did not provide for circumstances within each point source. On remand, the EPA was directed to use current cost figures rather than 1971 figures when determining the best practicable control technology currently available. (Comer-Florida)
W76-12109

UNITED STATES V ZORGER (CONSTRUCTION OF THE LANGUAGE IN A DEED GRANTING A FLOWAGE EASEMENT).
407 F Supp 25-31 (WD Pa 1976). 7 p.

Descriptors: *Administrative decisions, *Pennsylvania, *Easements, *Land tenure, *Land use, Land development, Judicial decisions, Flood routing, Flood control, Right-of-way, Camp sites, Recreation facilities, Recreation wastes.
Identifiers: Estoppel.

The United States brought this action against defendant landowners to enjoin the maintenance of a campground in an area encumbered by a government flowage easement. The government alleged that the deed of easement prohibits construction of structures for human habitation. The defendants alleged that a governmental official orally represented that the government would grant permission for the campground. The Federal District Court granted the injunction on the basis that oral representations cannot as a matter of law extinguish deed restrictions. Under Pennsylvania law servitudes created by deed can be extinguished only by deed, written instrument or by operation of law. In addition, the government is not estopped because of representations made by an agent without authority. The fact that the campground accommodated tents, mobile homes, campers and trailers is no avoidance of the restriction. Such units are clearly devices of human habitation maintained upon the property in violation of express deed language.
W76-12110

COMMONWEALTH V. WESTCOTT (SUBMERGED LANDS ACT DEFINITION OF NATURAL RESOURCES AS INCLUDING FISH, MEANING THE POWER TO PRESERVE AND REGULATE).
344 NE2d 411-19 (Mass. 1976). 19 p.

Descriptors: *Massachusetts, *Submerged Lands Act, *Constitutional law, *Fishing, *Fish migration, Fish management, Ownership of beds, Preferences(Water rights), Natural resources, Navigable waters, Anadromous fish, Catadromous fish, Fishing gear, Nets, Commercial fishing, Sport fishing, Fish conservation, Regulation.
Identifiers: *Coastal waters, Water rights(Non-riparians).

Defendant resident of Rhode Island was arrested and charged with dragging for fish in Massachusetts waters during the summer months. Because the statutory prohibition and criminal liability was directed only against Massachusetts non-residents, the defendant challenged the statute on constitutional grounds. The Supreme Judicial Court of Massachusetts, on direct appeal, held that the imposition of different treatment for resident on non-resident fisherman rendered the statute unconstitutional. The ownership theory under which a state claims ownership of water resources has never been made applicable to migratory fish but is limited to statutory resources such as oysters. The Submerged Lands Act of 1953, while purporting to grant states title to natural resources within state navigable waters, actually confirms only pre-existing state rights. The Act does not enlarge the rights of states, but merely reserves to states regulatory and preservation power. States cannot, therefore, discriminate against non-residents on the basis of natural resource ownership of residents. (Comer-Florida)
W76-12111

CENTRAL ILLINOIS PUBLIC SERVICE CO. V. EPA (THE TAKING ISSUE AND EFFLUENT STANDARDS).
344 NE2d 229-39 (Ill. Ct. App. 1976). 11 p.

Descriptors: *Illinois, *Administrative agencies, *Water rights(Riparians), *Lakes, *Legislation, *Constitutional law, Eminent domain, Permits, Water quality control, *Water pollution control, State jurisdiction, Water rights, Artificial lakes, Surface waters, Discharge(Water), Influent streams, Effluent streams, Water policy, Water permits, Water utilization, Heated water, Water pollution sources, Water pollution treatment.
Identifiers: *Administrative regulations, Licenses.

Plaintiff Illinois public utility brought this action challenging the power of the Environmental Protection Agency and the state pollution control board to regulate discharges into an artificially created lake located on private property. The appellate court affirmed the agency powers, holding that the state pollution control board is granted statutory powers to administer the pollution control laws of the state. Under the law, discharge into any waters of the state is covered since 'waters' is defined to include all water accumulations, including artificial and private ones. This definition gave the board power to control discharge into plaintiff's lake. Furthermore, such regulation power was not an unconstitutional taking of personal property without due process. The plaintiff's property was not appropriated for public use; its use was merely regulated by laws enacted to protect the general health and welfare. The Court also held that the agency's regulation of discharges into the lake was not a denial of equal protection. (Comer-Florida)
W76-12112

LANE V UNITED STATES (DUTY OF CARE OF COAST GUARD TO MARK SUBMERGED WRECKS).
529 F2d 175-80 (4th Cir 1975). 6 p.

Descriptors: *Obstruction to flow, *Boats, *Hazards, *Navigable rivers, *Warning systems, Federal government, Administrative agencies, Navigation, Navigable waters, Judicial decisions, Charts, Rivers, Channels, Barges, Accidents, Damages, Negligence, Legal aspects, Drowned(Submerged).
Identifiers: *Navigation obstructions, Notice, Intracoastal waterway.

Plaintiff boat owner brought suit in admiralty against defendant United States for failure to mark a sunken wreck. The plaintiff was operating his vessel in the Intracoastal Waterway when he struck an unmarked sunken barge and his own boat sank. The plaintiff contended that the federal government was responsible for marking the wreck. The United States contended that its duty to mark the wreck was discretionary; furthermore that duty was satisfied by publication of a navigational chart showing the location of the wreck. The trial court ruled that the United States had a mandatory duty either to mark the wreck or to remove it. The Fourth Circuit Court of Appeals held that the duty to mark unremoved wrecks in navigable waters is discretionary rather than mandatory and remanded the case to determine if there had been an abuse of discretionary authority. The court also stated that wrecks which constitute hazards to navigation must be marked physically; publication of a chart is not sufficient. (Capehart-Florida)
W76-12113

STATE BOARD OF TRUSTEES OF THE INTERNAL IMPROVEMENT TRUST FUND V SEA-AIR ESTATES, INC (DEFINITION OF ARTIFICIALLY CREATED NAVIGABLE WATERS).
327 So2d 823-25 (3d DCA Fla 1976). 3 p.

Descriptors: *Florida, *Permits, *Artificial watercourses, *Excavation, *Navigable waters, Channels, Legal aspects, Legal review, Judicial decisions, Jurisdiction, Regulation, State governments, Channel improvement, Canals, Legislation, Watercourses(Legal aspects), Canal construction, Dredging, Administrative agencies.

Plaintiff state agency sought to enjoin defendant landowners to replace fill excavated from the defendants' land. The defendants owned property on which there were several artificially created navigable waterways. The defendants had excavated land in the waterways by 'pulling the plugs' between the channels. The plaintiff contended that the waterways were not artificially created and that a permit was required for such excavation whether the waterways were artificial or naturally created. The trial court found for the defendants and the Florida Third District Court of Appeal affirmed holding that the plaintiff had no regulatory jurisdiction over excavation conducted wholly within artificially created navigable waters. The court distinguished the defendants' action of removing land in an artificially created waterway from the restricted actions of constructing islands or adding to or extending lands into either artificial or natural navigable waterways. (Capehart-Florida)
W76-12114

RULES FOR CONSTRUING REAL ESTATE DESCRIPTIONS (CONVEYANCES OF PROPERTY WHEN TIDEWATERS OR STREAMS FORM BOUNDARIES).
Alas Stat Ann sec 09.25.040 (1973).

Descriptors: *Non-navigable waters, *Alaska, *Boundaries(Property), *Low water mark, *Legislation, Land tenure, Beds under water, Streams, Real property, State government, Riparian rights.

Alaska has enacted the following rules for construing real estate descriptions: (1) when the construction of a descriptive part of a conveyance of property is doubtful and a non-navigable stream

er is the boundary, the rights of the grantor to thread of the stream are included in the conance except where the bed of the stream is held r another title; and (2) when the construction descriptive part of a conveyance is doubtful he tidewater is the boundary, the rights of the tor to the low-water mark are included in the eyance. (Comer-Florida)
-12115

HARGING BALLAST INTO NAVIGABLE ERS (OBSTRUCTION OF NAVIGATION).
Stat Ann sec 11.65.010 (1973).

riptors: *Obstruction to flow, *Ships, ka, *Navigable waters, Bays, Rivers, Har- Channels, State jurisdiction, Legislation, s of water, Navigation, State governments, ties(Legal).
fiers: *Navigation obstructions, *Ballast.

erson who discharges ballast of a vessel into vigable portion or channel of a river, bay or r of the state or within the jurisdiction of the o as to obstruct navigation or injuriously ef- ne navigable portion or channel is punishapon conviction, by imprisonment or fine. erson need not be an officer of a vessel to be t to penalty. (Comer-Florida)
2116

IC MARINE FISHERIES COMPACT.
at Ann secs 16.45.010 thru 16.45.040 (1973).

ptors: *Alaska, *Interstate compacts, *Fish vation, *Fisheries, *Pacific Ocean, Tributa- ish, Fish eggs, Marine fish, Shellfish, mous fish, Marine fisheries, Oceans, Com- fishing, Fish management, Fish stocking, governments, Legislation, Jurisdiction, , California, Washington.
ers: *Pacific Marine Fisheries Commis-

te of Alaska may enter into a compact with nia, Oregon, and Washington to cooperate Pacific Marine Fisheries Commission. The s of the compact are to promote better use ries and to develop a joint program to pro- fisheries in the areas of the Pacific Ocean nich the compacting states have jurisdic- y state having rivers or streams tributary Pacific Ocean may become a member by the compact. The commission is made up sentatives of each state. To preserve the and protect them from overfishing, epletion or any other abuse, the commis- recommend a coordinated exercise of the ower of the member states. The commis- all also draft and recommend to the states legislation relating to conservation isheries within their jurisdictional areas. mission may recommend stocking of the ith fish and fish eggs and may act as the ting agency for the stocking when done two or more states. (Capehart-Florida)
17

LIABILITY FOR THE DISCHARGE OF OUS SUBSTANCES.
Ann sec 46.03.822 (Supp 1975).

rs: *Alaska, *Water pollution control, tamination, *Damages, Path of pollu- ter pollution sources, Pollutant identifi- Pollution abatement, Control, Legisla- jurisdiction, State governments, United azards.
: *Absolute liability, Hazardous sub-

er or person having control of any substance which enters into or upon the ce, subsurface or waters of Alaska is ble, regardless of fault, for any personal injury or property damage, private or public, caused by entry. This law is applicable whenever not preempted by federal law. Affirmative defenses to strict liability exist if the entry of the substance is proved to be caused solely by an act of war, an intentional or negligent act of a third party not in privity of contract with or employed by the owner or person in control of the substance, negligence on the part of the State of Alaska or the United States government, or an act of God. Except for the defense of entry as an act of war the affirmative defenses relieve the owner or controller of strict liability only if additional proof establishes that operations to contain and clean up the substance were begun within a reasonable time of discovery of entry. In actions brought by the state for recovery of oil pollution damages a statutory damage limit also exists. (Comer-Florida)
W76-12118

TRANSFER OF TIDE AND SUBMERGED LANDS.
Alas Stat Ann secs 38.10.010 thru 38.10.050 (1973).

Descriptors: *Alaska, *Beds, *Ownership of beds, *Cities, *Tidal marshes, *Wetlands, Surveys, Mapping, Boundaries(Property), Administrative agencies, Legislation, Costs, Payment, Cost repayment, Administrative costs, Legal aspects, Land tenure, Real property, Public lands.

This chapter of the Alaska Statutes provides that municipal corporations may be entitled to a conveyance of tide and submerged lands and may subsequently convey such lands to occupants of those lands who hold preference rights. The lands shall be surveyed by the Department of Natural Resources to define the outside boundary. Costs of the survey are chargeable to the municipal corporation. (Capehart-Florida)
W76-12119

NATURAL RESOURCES (CONSERVATION POLICY, DEVELOPMENT, PUBLIC RIGHTS--ALL STATE NATURAL RESOURCES).
Alas Const art 8, secs 1 thru 18.

Descriptors: *Alaska, *Natural resources, *Public rights, *Public access, *Fisheries, *Sustained yield, Mineral water, Fish, Surface waters, Subsurface waters, Beds, Tidal marshes, Navigable waters.

Alaska has enacted legislation providing that the state policy is to encourage the settlement of its land and development of resources in a means consistent with the public interest. Accordingly, whenever occurring in their natural state all waters, fish and wildlife are reserved for common use. All lands including submerged and tidal lands are in the public domain and the legislature may select areas of value to be reserved for the use of the people. All other lands may be sold or granted. Fish and other replenishable resources must be maintained on the sustained yield principle and no exclusive right of fishery may be created in the natural waters of the state. Free access to navigable and public waters may not be denied any citizen of the United States or resident of the state. All surface and subsurface waters are reserved to the people for common use but are subject to appropriation. Mineral and medicinal waters are not reserved. (Comer-Florida)
W76-12120

IRRIGATION (RIGHTS TO UNAPPROPRIATED WATERS).
Colo Const art 16 sec 5 thru 8.

Descriptors: *Streams, *Appropriation, *Legal aspects, *Water rights, *Priorities, Prior appropriation, State governments, Beneficial use, Rivers, Ditches, Canals, Flumes, Agriculture, Manufacturing, *Irrigation, *Colorado.

Colorado has enacted legislation providing that all stream water in the state not previously appropriated is subject to appropriation and is considered public property. Priority of appropriation shall give the right as between users for the same purpose. Where there is not enough water, the following priorities shall operate: domestic purposes, first; agricultural purposes, second; manufacturing purposes, third. For all these purposes the right of way for ditch, canal and/or flume construction shall not be abridged where just compensation is given. Finally, each board of county commissioners shall establish maximum water-use rates. (Frank-Florida)
W76-12121

CONSERVANCY LAW OF COLORADO -- FLOOD CONTROL.
Colo. Rev. Stat. Ann. secs 37-1-101 through 37-3-117 (1973).

Descriptors: *Colorado, *Flood control, *Channel improvement, *Flood protection, *River regulation, Legislation, Flood damage, Multi-purpose projects, Water management(Applied), Legal aspects, Overflow, Floods, Streamflow, Water injury, Warning systems, Diversion structures, Water conservation, Water districts, Water utilization, Water law.
Identifiers: Petition, Conservancy district.

For purposes of flood control, regulation of stream channels, regulation of the flow of streams, and the control of watercourses, the district court in any county in Colorado has jurisdiction to establish a conservancy district. Subsidiary purposes of the established district are conservation, development, utilization and disposal of water for agricultural, municipal and industrial uses. The initial step in the organization of a conservancy district is the filing of a petition in the office of the clerk of the court vested with jurisdiction. Upon a hearing the court shall adjudicate the questions of jurisdiction and organization, and enter a decree incorporating the district. The court then appoints a board of directors of the district. The board is given a general grant of power in order to protect life and property when it is threatened by the normal flow, flood or overflow waters of any natural watercourse in the district. (Cowart-Florida)
W76-12122

WATER CONSERVANCY ACT.
Colo Rev Stat Ann 37-45-101 thru 37-45-120, 37-45-131 thru 37-45-135 (1973).

Descriptors: *Colorado, *Legislation, *Conservation, *Water resources, *Water districts, Water law, State governments, Water resources development, Groundwater, Eminent domain, Appropriation, Compensation, Legal aspects, Right-of-way, Condemnation, Water rights.

Colorado has enacted legislation to assist in the conservation of Colorado water resources by providing for the creation of water conservancy districts. Before a district may be created, a petition with the signatures of no fewer than 1500 owners of irrigated land situated within the territory to be organized must be presented to the clerk of the proper district court. Provisions are made for the notice and protest of hearings concerning the petition. Once the district is created, a board of directors shall be appointed by the court. This board shall have the power to: take in any legal manner all property necessary; dispose of and allocate water, water rights, and sources of supply; construct, operate or control all works necessary for the full exercise of its powers; exercise eminent domain; contract with any government or agency; fix water rates; adopt plans for district works; borrow money and incur indebtedness; acquire rights-of-way; and organize subdistricts. (Frank-Florida)
W76-12123

WATER RIGHTS--GENERALLY.
Colo Rev Stat Ann sec 37-81-101 thru 37-85-102 (1973).

Descriptors: *Colorado, *Water utilization, *Water rights, *Water resources, *Legislation, Ditches, Flumes, Streams, Weirs, State governments, Appropiation,Water law, Conservation, Water conservation, Penalties(Legal).

Colorado has enacted legislation making it unlawful to remove, by any means, water from the state. The state engineer shall enforce this provision by bringing all violations to the attention of the attorney general. All water is public property and is subject to appropriation, including natural springwater. Appropriators who introduce foreign water into a stream system have the right to make successive uses of such water. In addition, any person may divert water from one public stream into another and take out the same amount of water again. Water may also be loaned as between owners. Owners shall keep in repair all ditches, as well as provide for tail ditches where appropriate. Where a ditch crosses a highway, a bridge shall be built within three days. No excess of water shall be used during the summer season whatsoever. Measuring weirs and gauge rods shall be used on all ditches, canals, flumes or reservoirs. Where reservoirs are situated in the course of streams, water shall be released in quantities sufficient to prevent evaporation from depleting the natural flow of the stream. Finally, failure to deliver water is a misdemeanor, and taking too much will make one liable for actual damages. (Frank-Florida)
W76-12124

RESERVOIRS AND WATERWAYS.
Colo Rev Stat Ann sec 37-86-101 thru 37-89-104 (1973).

Descriptors: *Colorado, Appropriation, *Water use, *Legislation, *Rivers, Ditches, Flumes, Streams, Water conservation, Condemnation, Eminent domain, Reservoir storage, Reservoir releases, Reservoirs, Water law, Liability.

Colorado has enacted legislation providing that owners of water rights are entitled to rights-of-way through lands which lie between the points of use and diversion. This shall include only those structures, such as pipelines, necessary for the purpose required. There also exists a private right of condemnation; but no land shall be burdened with more than one ditch within the owner's consent. Furthermore, the shortest route and the most uniform grade possible must be used. The owner of the ditch must permit enlargement. Lateral ditch owners, when holding 60% or more of the land area served by one ditch, may incorporate. They may also, under eminent domain, condemn the remaining 40% provided just compensation is paid. Where there is a shortage, water will be appropriated on a pro-rata basis according to each person's entitlement. Reservoirs are permitted for storage of unappropriated water only. Water may be conducted into natural streams, but notice of release must be given to the proper irrigation division. Owners shall be liable for all leakage and overflow damages caused by escaping reservoir waters. Finally, the state engineer shall set maximum storage levels. (Frank-Florida)
W76-12125

UNDERGROUND WATER.
Colo Rev Stat Ann sec 37-90-101 thru 37-90-141 (1973).

Descriptors: *Appropriation, *Colorado, *Legislation, *Underground, *Underground streams, *Water sources, Water resources, Beneficial use, State governments, Wells, Aquifers, Drilling, Prior appropriation, Groundwater resources, Groundwater availability.

Colorado has enacted legislation controlling the appropriation of all groundwaters in the state. To assist in the appropriation procedures, a groundwater commission is established. Its powers include: designation of groundwater basins; issuance of appropriation permits; determination of priority of appropriation; limitation of withdrawal where necessary; establishment of reasonable pumping levels; and the issuance of well construction permits. Also created are groundwater management districts and water conservation boards, whose duties are described. All hearings by these boards and commissions shall be public, and provisions are made for due notice to the public. Management districts shall have the power to finance through bond issuance, and such regulations are included. Finally, provisions are given for procedures governing the inclusion or exclusion of any lands in such management districts. (Frank-Florida)
W76-12126

WATER WELL AND PUMP INSTALLATION CONTRACTORS.
Colo Rev Stat Ann sec 37-91-101 thru 37-91-112 (1973).

Descriptors: *Colorado, *Legislation, *Water sources, *Wells, Pumping, Pump testing, Aquifer, Permits, Penalties(Legal), Artesian wells, State governments, State jurisdiction, Drainage wells, Water resources.

Colorado has enacted legislation creating a state board of examiners of water well and pump installation contractors. The board shall: exercise authority over construction and installation of all wells; adopt rules to effectuate this article; examine and control the licenses of applicants; and conduct hearings with respect to license denial, revocation or suspension. Licensing requirements are subsequently stated, as well as basic principles and minimum standards for the construction, repair or abandonment of all wells and pumping equipment. (Frank-Florida).
W76-12127

RIVER BASIN AUTHORITIES.
Colo Rev Stat Ann secs 37-93-101 thru 37-93-108 (1973).

Descriptors: *Colorado, *River basin development, *River basin commissions, *Condemnation, *Water resources, Right-of-way, Water utilization, Water supply, Water supply development, Water storage, Water transfer, Pipes, Pipelines, Taxes, Tax rates.

Colorado has enacted legislation creating thirteen river basin authorities to promote stability of ground and surface water supplies. Groundwater basins are made exclusive of river basins. Each basin authority has the power to: construct and operate all water transport and storage facilities; condemn lands for such constructions; raise revenue by taxing real property; tax each water user up to three cents per acre-foot; issue bonds payable from ad valorem taxes on property; appropriate all unappropriated waters; establish standards for water utilization; and enter contracts with other river basin authorities. Denver is made exempt from inclusion in any basin authority. Finally, no area served by an urban water supply shall be included in a basin authority without its consent. (Frank-Florida)
W76-12128

DITCH AND RESERVOIR COMPANIES (RIGHTS AND DUTIES).
Colo Rev Stat Ann sec 7-42-101 thru 7-42-117 (1973).

Descriptors: *Colorado, *Ditches, *Reservoirs, *Legislation, *Water rates, Water law, Construction, Right-of-way, Repairing, Permits, Canals, Channels, Excavation, Water contracts, Water conveyance, Adoption of practices, Administrative agencies.
Identifiers: Notice

Colorado has enacted legislation establishing rules and regulations for ditch and reservoir companies in the state. Work on any project shall not take more than two years, nor commence more than 90 days after issuance of a certificate. Exceptions to this provision are listed. A right of way shall be granted following the line named in the certificate, subject only to prior rights still in existence. Stock purchase and assessment rules are stated. Preference for water use shall be given to the class named in the certificate when there is a shortage. Rates shall be fixed by the board of county commissioners. Each company shall keep its ditches in good repair. Corporate rules pertaining to notice, extension and certification are also given. (Frank-Florida)
W76-12129

POWERS AND FUNCTIONS OF CITIES AND TOWNS (WATER RELATED).
Colo Rev Stat Ann sec 31-12-101(22) thru (24),(35),(38) thru (40),(75),(77) thru (79) (1973).

Descriptors: *Treatment facilities, *Colorado, *Municipal water, *Legislation, *Local governments, Water resources, Canals, Reservoirs, Eminent domain, Sewers, Sewage treatment, Taxes, Financing, Condemnation, Condemnation value, Water pollution treatment.

Colorado has enacted legislation providing that town and city governing bodies shall have the right to construct, maintain and assess taxes for sewers and watermains, alter in any way all watercourses and provide for water purification and construction of water pollution facilities. They may also issue bonds for such construction, enter into contracts with industry for the provision of such services or to extend treatment works partially outside the municipality. In the last instance, jurisdiction shall extend for five miles above the point from which water is taken for treatment. Also, governing bodies of cities and towns are given power to: build and levy taxes on wells and reservoirs; charge for the supply of water to outside consumers; regulate the construction of all water pipes and facilities; condemn land for sewers and pipes; take private water upon payment of just compensation; and finally, to pass ordinances necessary to enforce all granted powers. (Frank-Florida)
W76-12130

WATER AND WASTEWATER TREATMENT PLANT OPERATORS.
Colo Rev Stat Ann secs 25-9-101 thru 25-9-1 (1973).

Descriptors: *Operation and maintenance, *Treatment facilities, *Colorado, *Waste treatment, *Waste water(Pollution), Water pollution control, Water pollution, Water quality, Water reuse, Pollutants, Treatment, Management, Operations, Standards, Water pollution treatment, Penalties(Legal).

Colorado has enacted legislation providing that waste and wastewater treatment plant operators must meet minimum standards of knowledge and experience. Operation by anyone not so qualified shall result in penalties both to the plant and to the operator. A plant operator's certification board shall consist of nine members, and its duties include: the setting forth of requirements for application; administration of certificates; promotion of training schools; and the establishment of five classes of operators in both the waste and water categories. Payment shall be for expenses only. Requirements for certification in each class are enumerated. The application and certification fees are also listed. (Frank-Florida)
W76-12131

REATION LAND PRESERVATION ACT OF
Rev Stat Ann secs 25-13-101 thru 25-13-114
).

riptors: *Colorado, *Law enforcement, reation facilities, *Recreation wastes, *State nments, Waste treatment, Waste water treat- Waste water(Pollution), Water pollution, ation, Camping, Campsites, Land use, s, Sewage, Sewage disposal.

ado has established minimum controls to it the pollution and degradation of declared recreational lands. Unlawful acts are listed, l as approved methods of sewage and refuse al. Water supply regulations are included, nits on group gatherings and camping dura- e stated. (Frank-Florida)
2132

ECTION OF FISHING STREAMS.
Rev Stat Ann secs 33-5-101 thru 33-5-107

otors: *Administrative agencies, ado, *Fishing, *Fish conservation, fe conservation, *Streams, Wildlife, Conservation, Environment, Wildlife ement, Resources, State governments, Ir- , Irrigation programs, Land resources, spects.

lo has enacted legislation providing that d wildlife resources, especially fishing shall be protected from encroachment by te agency. Exceptions shall be made for ry and appropriate changes, after con- n of all relevant factors. Requirements for ion and examination of plans, as well as nd arbitration, are stated. Irrigation pro- e exempt from provisions of this article. Florida)
33

ANDE WATER CONSERVATION DIS-
v Stat Ann sec 37-48-101 thru 37-48-105

ors: *Watershed management, o, *Conservation, *Rio Grande River, es, River regulation, Water law, Water s, Water policy, Water supply, Water n, Water control, Resources, Reservoirs, esources, State governments.

has enacted legislation creating the Rio Vater Conservation District to safeguard blic use the waters of the Rio Grande and ries. The District shall have power to: e sued; acquire and sell property; con- l raise buildings to implement conserva- ures; borrow money and issue bonds; private land for surveys; exercise the eminent domain and take rights-of-way; mwater at a level necessary to preserve ssess property taxes. (Frank-Florida)
4

ESTERN WATER CONSERVATION
Stat Ann sec 37-47-101 thru 37-47-107

s: *Watershed management, *Legislation, *Water conservation, , State governments, State jurisdiction, urces, Surface waters, Water supply, ply development, Eminent domain, y, Water distribution(Applied), Rivers, ributaries, *Water districts.
*Southwestern Water Conservation

The Southwestern Water Conservation District has been established to support conservation and beneficial use of the San Juan and Dolores Rivers and their tributaries. Specific boundaries for the District are stated. Powers include: the right to sue and be sued; acquire and sell property; conduct investigations to determine stream flows; enter upon land to do surveys; organize special assessment districts; and the right to exercise eminent domain to acquire property or rights-of-way necessary for improvements. (Frank-Florida)
W76-12135

COLORADO RIVER CONSERVATION DISTRICT.
Colo Rev Stat Ann sec 37-46-101 thru 37-46-107 (1973).

Descriptors: *Water resources development, *Colorado, Colorado River, *Colorado River Compact, *Conservation, State governments, Rivers, Running waters, River basins, River systems, Rocky Mountain region, Geographical regions, Colorado River Basin, Interstate compacts, Watershed management, *Water districts.
Identifiers: Colorado River Conservation District.

The Colorado River Water Conservation District was created in 1973 to safeguard for use and development the waters that Colorado is entitled to under the Colorado River Compact. Boundaries of areas for inclusion under the District are delineated. The District has 15 directors. Pay is $25 per working day plus expenses. The District's general powers include the right to sue and be sued, hold property, make surveys and contracts, organize special assessment districts, and use eminent domain to acquire needed land. (Frank-Florida)
W76-12136

6F. Nonstructural Alternatives

ENVIRONMENTAL INVENTORY AND ASSESSMENT OF NAVIGATION POOLS 24, 25, AND 26 UPPER MISSISSIPPI AND LOWER ILLINOIS RIVERS; FLOODPLAIN ANIMALS AND THEIR HABITATS,
Southern Illinois Univ., Carbondal, Cooperative Wildlife Research Lab.
For primary bibliographic entry see Field 6G.
W76-11747

ENVIRONMENTAL INVENTORY AND ASSESSMENT OF NAVIGATION POOLS 24, 25, AND 26, UPPER MISSISSIPPI AND LOWER ILLINOIS RIVERS; A VEGETATIONAL STUDY,
Missouri Botanical Garden, St. Louis.
For primary bibliographic entry see Field 6G.
W76-11748

APPROPRIATION BY THE STATE OF MINIMUM FLOWS IN NEW MEXICO STREAMS,
For primary bibliographic entry see Field 4A.
W76-11899

MINIMUM STREAMFLOW-FEDERAL POWER TO SECURE,
For primary bibliographic entry see Field 4A.
W76-11900

PUBLIC PARTICIPATION IN WATER RESOURCES DEVELOPMENT, A BIBLIOGRAPHY.
Office of Water Research and Technology, Washington, D.C.
For primary bibliographic entry see Field 6B.
W76-11903

COMPENSATION FOR OIL POLLUTION AT SEA: AN INSURANCE APPROACH,
San Diego Univ., Calif. School of Law.
For primary bibliographic entry see Field 5G.
W76-11975

WETLAND'S RELUCTANT CHAMPION: THE CORPS TAKES A FRESH LOOK AT 'NAVIGABLE WATERS',
Lewis and Clark Coll., Portland, Oreg. Northwestern School of Law.
For primary bibliographic entry see Field 4A.
W76-11976

THE LEGAL SETTING OF INTERNATIONAL CANALS,
USSR Academy of Science, Moscow, Institute of State and Law.
For primary bibliographic entry see Field 6E.
W76-12027

THE BENEFICIAL USE OF WATER RESOURCES AND GUIDELINES FOR ALLOCATION OF WATER RESOURCES IN TIMES OF EMERGENCY,
Spessard L. Holland Law Center, Gainesville, Fla.
For primary bibliographic entry see Field 6E.
W76-12045

THE TAKING ISSUE, FLOOD PLAIN AND WETLANDS ZONING,
Spessard L. Holland Law Center, Gainesville, Fla.
For primary bibliographic entry see Field 6E.
W76-12049

FLOOD PROTECTION ZONING AS A FACTOR IN DETERMINING DAMAGES IN EMINENT DOMAIN PROCEEDINGS,
Spessard L. Holland Law Center, Gainesville, Fla.
For primary bibliographic entry see Field 6E.
W76-12054

LOWER CONNECTICUT RIVER CONSERVATION ZONE.
For primary bibliographic entry see Field 6E.
W76-12091

6G. Ecologic Impact Of Water Development

ENVIRONMENTAL ASSESSMENT: A PLANNING TOOL,
Ontario Ministry of the Environment, Toronto. Environmental Approvals Branch.
M. E. Plewes.
In: Annual Conference Proceedings of the Ontario Section of the American Water Works Association, Pollution Control Association of Ontario, and Ontario Municipal Water Association, April 20-23, 1975. Toronto, Ontario, p 154-160.

Descriptors: *Planning, *Environmental effects, *Legislation, *Canada, *Legal aspects, *Assessments, Evaluation, Environmental control, Construction, Project planning.
Identifiers: Environmental impact statements, Ontario, Environmental Assessment Act.

The use of environmental assessment as a planning tool is discussed along with the development of Ontario's Environmental Assessment Act. The need for environmental assessment in Ontario has become apparent as a result of increased public interest in the environmental impacts of large-scale projects involving river diversions, sewage treatment plants, sewers, pipelines, and other construction activities. Recently, there has been a gradual shift in emphasis away from after-the-fact controls and towards restorative and preventive measures by environmental protection

organizations in Ontario. The Environmental Assessment Act is an example of this change in emphasis. The Act requires proponents of designated undertakings to submit to the Minister of the Environment an environmental assessment of the project which must be accepted by the Minister prior to project initiation. (See also W76-11249) (Kreager-FIRL)
W76-11649

A METHODOLOGY FOR EVALUATING DEVELOPMENT-ENVIRONMENTAL CONFLICTS ON WILD AND SCENIC RIVERS,
Idaho Univ., Moscow. Dept. of Agricultural Economics.
E. L. Michalson, and J. R. Hamilton.
Water Resources Bulletin, Vol. 11, No. 6, p 1149-1156, December 1975. 2 fig, 3 tab, 4 ref. OWRT B-014-IDA(IT).

Descriptors: *Water resources development, *Environment, *Wild rivers, Methodology, Evaluation, Cost-benefit ratio, Hydroelectric power, Recreation demand, Irrigation, Economics, Growth rates, *Idaho.
Identifiers: *Salmon River(Idaho).

A methodology is developed for examining the environmental and developmental conflicts inherent in the classification process of a wild river. First, inventory studies of resources are made to determine areas of concern affecting wild and scenic river status. Second, the resource uses for the river are evaluated in order to narrow the range of relevant resource uses. Finally, an economic comparison of use tradeoffs is made; the alternatives include: (1)a wild river; (2)a partially developed river; and (3)a completely developed river. The comparisons are based on estimated consumer surplus values resulting from hydroelectric power and outdoor recreation alternative uses of the Salmon River. In examining the alternatives for the Salmon River, the procedures outlined in the United States Water Resources Council's Establishment of Principles and Standards for Planning Water and Related Land Resources is generally followed. Final comparisons show that hydroelectric development had greater net benefits than outdoor recreation at up to a three percent recreation growth rate. When recreation use grew at a faster rate, recreation had a considerable margin of net benefits in its favor. (Bell-Cornell)
W76-11707

ENVIRONMENTAL INVENTORY AND ASSESSMENT OF NAVIGATION POOLS 24, 25, AND 26 UPPER MISSISSIPPI AND LOWER ILLINOIS RIVERS; FLOODPLAIN ANIMALS AND THEIR HABITATS,
Southern Illinois Univ., Carbondal, Cooperative Wildlife Research Lab.
V. A. Terpening, J. R. Nawrot, M. J. Sweet, and D. L. Damrau.
Available from the National Technical Information Service, Springfield, Va 22161, as ADA-009 781, $9.25 in paper copy, $3.00 in microfiche. Contract Report Y-75-2, April 1975. 270 p, 2 fig, 25 tab, 4 map, 168 ref, 8 append. Army DACW39-74-0107.

Descriptors: *Environment, *Surveys, *Animal populations, *Mississippi River basin, Ecology, Rivers, Navigable rivers, Habitats, Wildlife habitats, Wildlife, Sampling, On-site investigations, Mammals, Birds, Reptiles, Animal diseases, Environmental effects, Flooding, Flood plains.
Identifiers: *Illinois River, Environmental inventories.

An inventory of the animals and their habitats was conducted in the lower Illinois River floodplain between Grafton and Beardstown, Illinois, and in the upper Mississippi floodplain between Alton, Illinois, and Hannibal, Missouri, to provide data for an environmental impact statement. Seven habitats were distinguished in the unprotected floodplain. A total of 49 species of mammals, 286 species of birds, and 81 species and subspecies of amphibians and reptiles were expected to exist in the study area. Seven wildlife-related diseases may occur in the study area; none were of major public health concern. In the counties of the study area, hunting and trapping were valued at an estimated $6.8 million per year; wildlife-oriented, nonconsumptive recreation in the Mark Twain Refuge within the study area was valued at about $3.7 million per year. Four wildlife refuges and management areas covering more than 54,000 acres were located in the study area. Floodplain flora and fauna remain relatively unaffected by floods of short duration, but prolonged periods of flooding may be detrimental. Four maintenance activities are conducted in the study area: pool regulation, bank revetment, wing dike maintenance, and dredging. Operation and maintenance activities in combination with levees and agricultural siltation will ultimately reduce the ecological diversity of the unprotected floodplain. (Sims-ISWS)
W76-11747

ENVIRONMENTAL INVENTORY AND ASSESSMENT OF NAVIGATION POOLS 24, 25, AND 26, UPPER MISSISSIPPI AND LOWER ILLINOIS RIVERS; A VEGETATIONAL STUDY,
Missouri Botanical Garden, St. Louis.
W. M. Klein, R. H. Daley, and J. Wedum.
Available from the National Technical Information Service, Springfield, Va 22161, as ADA-009 065, $6.75 in papr copy, $3.00 in microfiche. Contract Reort Y-75-1, April 1975. 143 p, 22 fig, 6 tab, 4 map, 47 ref, 3 append. Army DACW39-74-0088.

Descriptors: *Environment, *Surveys, *Vegetation, *Mississippi River, *Mississippi River basin, Ecology, Rivers, Navigable rivers, Forests, Wetlands, Flood plains, Deciduous forests, Deciduous trees, Trees, Maple trees, Willow trees, Oak trees, Cottonwoods, Hickory trees, Ash trees, Mapping, Maps, Vegetation effects, Environmental effects.
Identifiers: *Illinois River, Environmental inventories.

The purpose of this study was to provide a vegetation map and descriptions of vegetational types and their successional patterns to be used in an environmental impact analysis of the effects of maintenance and operation of the nine-foot navigation channel in Pools 24, 25, and 26 on the Upper Mississippi and Lower Illinois Rivers. Seven vegetation types were described after field examination of 116 stands: two non-forest types, old fields and wetlands; and five forest types, willow, silver maple-cottonwood, silver maple-cottonwood-pin oak, pin oak, and oak-hickory. All of these types were mapped with the exception of old fields, which were omitted because they are often subject to cultivation after a short period of abandonment. The silver maple-cottonwood community was found to be the most extensive type. Analysis of successional trends indicated that ash (Fraxinus spp.) and American elm (Ulmus americana) may become more important in many of the silver maple forests and that pin oak forests may also replace them particularly in areas protected from flooding by levees. The existing forest patterns are related to geomorphology and prediction of future plant communities rests strongly on the prediction of the geomorphic environment. The maintenance and operation of the 9-foot navigation channel has potential ecological effects. This research began the study of those effects on limited sections of the Mississippi and Illinois Rivers, but what must be done now is to examine the Upper Mississippi River Basin as a whole by an integrated team of biologists, geologists, and social scientists. (Sims-ISWS)
W76-11748

PRACTICAL APPLICATIONS OF SPACE SYSTEMS, SUPPORTING PAPER 7, ENVIRONMENTAL QUALITY.
National Research Council. Washington, D. C. Panel on Environmental Quality.
For primary bibliographic entry see Field 4A.
W76-11760

PUBLIC LAW 92-500-- WATER QUALITY ANALYSIS AND ENVIRONMENTAL IMPACT ASSESSMENT, TECHNICAL REPORT (VOLUME I),
National Commission on Water Quality. Washington, D. C. Environmental Sciences Sector
For primary bibliographic entry see Field 5G.
W76-11806

PUBLIC LAW 92-500--WATER QUALITY ANALYSIS AND ENVIRONMENTAL IMPACT ASSESSMENT, TECHNICAL REPORT, VOLUME II,
National Commission on Water Quality, Washington, D. C. Environmental Sciences Sector.
For primary bibliographic entry see Field 5G.
W76-11807

RELATING ENVIRONMENTAL MODELING TO POLICY ISSUES AND DECISIONS,
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-11879

MATHEMATICAL MODELLING AND ENVIRONMENTAL DECISION-MAKING,
Department of Environment, Ottawa, Ont. Canada, Environmental Systems Branch.
A. K. Biswas.
Ecological Modelling (International Journal on Ecological Modelling and Engineering and Systems Ecology), Vol. 1, No. 1, p 31-48, May 1975. 1 fig, 15 ref.

Descriptors: *Decision making, *Mathematical models, *Systems analysis, Water resources Management, Environment, Water policy.
Identifiers: Credibility.

The primary role of a decision maker is to make right decisions on the basis of available information and within the allowable time and resource constraints. The two basic types of models used for decision making, technocratic and incremental, are discussed, and so are the common criteria of the decision-making process in a real world. The intensity and diversity of demands on our limited water resources have increased to such an extent that decision makers find it increasingly difficult to consistently attain the needed flexibility and dexterity. The average decision maker has been provided with few, if any, new tools and concepts in the past several decades. One of these few techniques is systems analysis. But modelling lacks credibility with the policy makers. The several reasons for this 'credibility gap' are discussed in depth. Ten basic rules are suggested as guidelines for realistic model development. The positive and negative aspects of modelling for decision making are discussed. Appropriate remedies are suggested to improve the image of modelling in the eyes of the decision maker which will reduce the proliferation of unvalidated untested and unuseful models. In conclusion, even though some of our current models in this field are rather crude, the issue, in the final analysis, is very definitely on the side of having a model, even a crude one, against having no model at all. (Bell-Cornell)
W76-11880

TROLEUM DEGRADATION IN LOW TEM-
RATURE MARINE AND ESTUARINE EN-
ONMENTS,
de Island Univ., Kingston. Dept. of Plant
iology-Entomology.
primary bibliographic entry see Field 5B.
-11924

ASTAL ZONE POLLUTION BY OIL AND
IER CONTAMINANTS: GUIDELINES FOR
ICY, ASSESSMENT AND MONITORING IN
PICAL REGIONS. BASED UPON A CASE
DY IN INDONESIA, IN 1973,
hsonian Institution, Washington, D. C.
primary bibliographic entry see Field 5B.
-11935

BIOLOGICAL AND ECOLOGICAL EF-
TS OF OIL POLLUTION IN TROPICAL
ERS. AN ANNOTATED BIBLIOGRAPHY,
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ternational and Environmental Programs.
rimary bibliographic entry see Field 5C.
11936

LOW-UP FIELD SURVEY OF THE OIL
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A and M Research Foundation, College Sta-

imary bibliographic entry see Field 5C.
1943

ENVIRONMENT AND THE OFFSHORE
NDUSTRY IN SCOTTISH WATERS - A
EW. PART 1. THE DEVELOPING
TIME GEOGRAPHIC PATTERN,
stle upon Tyne Polytechnic (England).
f Humanities.
mary bibliographic entry see Field 5B.
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ENVIRONMENT AND THE OFFSHORE
NDUSTRY IN SCOTTISH WATERS - A
W. PART 2. THE REGIONAL PATTERN
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f Humanities.
mary bibliographic entry see Field 5B.
946

IL AND GAS - AN ENVIRONMENTAL
SMENT. A REPORT TO THE PRE-
T BY THE COUNCIL ON ENVIRONMEN-
UALITY, VOLUME 1.
on Environmental Quality, Washington,

le from the Supt. of Documents, GPO,
ton, D. C. 20402, Price $2.90. April 1974.
append.

tors: *Atlantic Ocean, *Alaska,
nmental effects, *Resources develop-
ater resources, *Oil pollution, *Oil spills,
pollution effects, *Water quality control,
, *Management, Gases, Exploration,
ns, Transportation, Hazards, Weather,
ents, Planning.
rs: *Outer Continental Shelf, *Offshore
gy, U. S. East Coast, Atlantic Continental
lf of Alaska, Energy resources.

he first volume of a set of five that con-
report to the President by the Council on
nental Quality. This report assesses the
environmental impacts of oil and gas
ent on the Atlantic and Gulf of Alaska
tinental shelves: Chapter 2, Oil and Gas
s, examines estimates of potential oil and
rces in the Atlantic and Gulf of Alaska;
, Perspectives on Energy Growth, pro-
ntial energy needs and evaluates the en-
tal impacts of fuels that can be used to meet these needs; Chapter 4, Technology for Developing Oil and Gas Resources Offshore, reviews the basic steps of offshore oil and gas exploration and presents estimates of oil spill probabilities; Chapter 5, Natural Phenomena and OCS Development, explores the unusual physical conditions facing operations in the Atlantic and in Alaska; Chapter 6, Offshore Effects of OCS Development, concentrates on the environmental impact of operations in the ocean, on the shelf, and along the coast resulting from the exploration, production, and transportation of oil and gas; Chapter 7, Onshore Effects of OCS Development, analyzes the economic, social, and environmental impacts of onshore development-oil refining, gas processing, petrochemical manufacturing, and support services--induced by development offshore; Chapter 8, Technology and Environmental Protection, examines the extent to which oil and gas exploration and production technology and practices protect the environment; and Chapter 9, Institutional and Legal Mechanisms for Managing OCS Development, looks into the effectiveness of Federal regulatory and enforcement processes and the broader issues of government coordination and planning. (See also W76-11948 thru W76-11955) (Sinha - OEIS)
W76-11947

OCS OIL AND GAS - AN ENVIRONMENTAL ASSESSMENT. A REPORT TO THE PRESIDENT BY THE COUNCIL ON ENVIRONMENTAL QUALITY, VOLUME 2, (APPENODICES).
Council on Environmental Quality, Washington, D. C.
Available for sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402 Price $3.70. April 1974, 278 p.

Descriptors: *Water quality control, *Environmental effects, *Fossil fuels, *Oil pollution, Continental Shelf, Assessments, Resources development, Water resources, Oil spills, Contracts.
Identifiers: *Outer Continental Shelf, *Offshore technology, Gulf of Alaska, U. S. East Coast, Environmental impact, Energy sources, Public hearings.

This is the second volume in a set of five containing the Council's report to the President. It consists of the following appendixes: Appendix A - Federal Agency Contributors; Appendix B - Contracts,Issued; Appendix C - Members of Governors' ADvisory Committee; Appendix D - Summary of World Oil and Gas Reserves and Production; Appendix E - Oil and Gas Resource Classification and Estimates, Bureau of Mines and U. S. Geological Survey; Appendix F - Methodology for Selecting Hypothetical Locations of Possible Oil and Gas Accumulations, U. S. Geological Survey; Appendix G - The National Energy Scene, Walter G. Dupree, Jr.; Appendix H - A National Energy Conservation Program: The Half and Half Plan; Appendix I - Environmental Impacts of Alternatives to Outer Continental Shelf Oil and Gas Production, Hittman Associates, Inc.; Appendix J - Some Environmental Considerations in the Petroleum Refining Industry, Radian Corporation; and Appendix K - Summary of the Public Hearings held by the Council on Environmental Quality on the Environmental Impacts of Potential Oil and Gas Development of the Atlantic and Gulf of Alaska OCS, September-October 1973. (See also W76-11947) (Sinha - OEIS)
W76-11948

OCS OIL AND GAS - AN ENVIRONMENTAL ASSESSMENT. A REPORT TO THE PRESIDENT BY THE COUNCIL ON ENVIRONMENTAL QUALITY, VOL. 3, THE EFFECT OF NATURAL PHENOMENA ON OCS GAS AND OIL DEVELOPMENT.
Tetra Tech, Inc., Pasadena, Calif.
Vol 3 for sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402 Price $2.65. April 1974. 106 p, 22 fig, 16 tab, 22 ref, append.

Descriptors: *Water quality control, *Environmental effects, *Resources development, Assessment, Continental Shelf, Earthquakes, Tsunamis, Climates, Soil stability, Oil pollution, Oil spills, Exploration, Production, Storage, Transportation, Hazards, Pipelines.
Identifiers: *Outer Continental Shelf, *Offshore technology, Underwater storage, Tankers, Floating storage, Gulf of Alaska, U. S. East Coast.

This report is the first part of Volume 4 which is part of a 5 volume set. The effects of each of the natural elements and the volume of oil at risk is summarized. Severe storms are assessed as 'moderate' threats in the case of afloat and underwater storage because of the volume of oil that is at risk. Earthquakes vibrations seriously threaten underwater storage. Whether acceptable designs can be developed that will be able to withstand severe Alaskan earthquakes will require further study. In fact it may be very difficult to develop designs that will withstand the relatively infrequent Atlantic earthquakes. Since such a large volume of oil is a risk, earthquake vibrations have been classified 'serious' threats with respect to underwater storage. Soil stability is also a serious factor in underwater storage. The stability of soil beds (which also includes faulting) will also threaten pipelines. Tsunamis are a serious hazard to both underwater storage and tankers moored at fixed berths. In both cases the volume of oil at risk is large. Furthermore, in the case of the tanker, the oil would be released at the shoreline, an area considered to be the most ecologically sensitive. Use of pipeline and ashore storage is evaluated best for both the Atlantic OCS and the Gulf of Alaska. In the Alaskan area tanker transport will be required. A floating moor rather than fixed berths represents a lesser risk of massive oil spillage. In the event that soil conditions are such that pipelines will be exposed to unacceptable risks, floating storage may be an acceptable alternate for use in both OCS areas. (See also W76-11947) (Sinha - OEIS)
W76-11949

OCS OIL AND GAS - AN ENVIRONMENTAL ASSESSMENT. A REPORT TO THE PRESIDENT BY THE COUNCIL ON ENVIRONMENTAL QUALITY, VOL 3, TOWARD RESOLVING PROBLEMS IN OUTER CONTINENTAL SHELF TECHNOLOGY.
Resources for the Future, Inc., Washington, D. C.
Vol 3 available for sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402 Price $2.65. April 1974. 87 p.

Descriptors: *Water quality control, *Environmental effects, *Resources development, *Conferences, Exploration, Continental Shelf, Oil industry, Oil pollution, Oil spills, Leases, Drilling, Transportation, Storage.
Identifiers: *Outer Continental Shelf, *Offshore technology, *Environmental impact, Oil production, Containment.

Part Two of the fourth volume in a set of five volumes which make up the report by the Council on Environmental Quality consists of a report by Harry Perry on the Conference Background and Summary. The conference which was requested by the CEQ and held by Resources for the Future Inc., had three goals: evaluate the current status of technology and its applicability for use in the new provinces being considered for leasing; estimate the degree of risk of environmental damage from the application of current technology to the areas; and identify improvements, if any, still required in OCS technology to operate with acceptable environmental risks, and the R&D required to achieve them. The remainder of Part Two consists

of the agenda of the Conference which was held December 5m6, 1973 in Arlington, Virginia; Lists of Participants; and the various panel reports on Drilling Technology, Production Technology, Oil Spills and Containment, and Transport and Storage. (See also W76-11947) (Sinha - OEIS)
W76-11950

OCS OIL AND GAS - AN ENVIRONMENTAL ASSESSMENT. A REPORT TO THE PRESIDENT BY THE COUNCIL ON ENVIRONMENTAL QUALITY, VOL 4, POTENTIAL ONSHORE EFFECTS OF OIL AND GAS PRODUCTION ON THE ATLANTIC AND GULF OF ALASKA OUTER CONTINENTAL SHELF.
Resource Planning Associates, Inc., Washington, D. C.
For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402 Price $6.65. April 1974. 400 p, numerous fig, tab, ref, append.

Descriptors: *Water quality control, *Environmental effects, *Resources development, *Fossil fuels, *Oil pollution, Alaska, Water pollution, Economics, Land use, Oil industry, Assessments, Social aspects.
Identifiers: *Outer Continental Shelf, U. S. East Coast, U. S. West Coast, *Offshore technology, Environmental impact, Socio-economic impact, Onshore effects, Gulf of Alaska, Petrochemical industry, Hydrocarbons.

This report of the potential onshore effects of offshore oil and gas development on the Atlantic and Gulf of Alaska Outer Continental Shelves makes up the fourth volume in a set of five volumes making up the CEQ's Report to the President. The first two parts present detailed findings for the East Coast and West Coast, respectively. The remainder contains appendixes with backup detail on primary industries, i e., those which were analyzed in depth and on the methodology used to measure onshore socio-economic and environmental impacts. Finally, two computer runs, submitted to the CEQ, supplement the detail provided in Appendixes Vi and IX, and cover the detailed economic and air and water pollution findings. (See also W76-11947) (Sinha - OEIS)
W76-11951

OCS OIL AND GAS - AN ENVIRONMENTAL ASSESSMENT. A REPORT TO THE PRESIDENT BY THE COUNCIL ON ENVIRONMENTAL QUALITY, VOL 5, POTENTIAL BIOLOGICAL EFFECTS OF HYPOTHETICAL OIL DISCHARGES IN THE ATLANTIC COAST AND GULF OF ALASKA.
Massachusetts Inst. of Tech., Cambridge, Mass.
Vol 5 for sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402, Price $6.50. April 1974. 124 p, 11 fig, 47 tab, 163 ref, append.

Descriptors: *Environmental effects, *Oil spills, *Oil pollution, *Resources development, Water quality control, Continental Shelf, Alaska, Water resources, Biota, Water pollution sources, Offshore platforms, Assessments, Birds, Fish, Habitats.
Identifiers: *Outer Continental Shelf, *Environmental impact, Offshore technology, Biological effects, Hydrocarbons, U. S. Atlantic Coast, Gulf of Alaska.

The first report in Volume 5 of the CEQ's Report to the President is an analysis of the primary biological effects of potential oil discharges resulting from hypothetical oil production activity on the Atlantic/Alaskan OCS. Although emphasis is placed on analysis of impacts and recovery from large-volume infrequent accidental oil spills, small volume continuous discharges of hydrocarbons are also considered. Effects of oil releases from offshore platforms and spills occuring at coastal terminals are assessed. This report deals specifically with biological factors and the following conclusions are reached. Biological recovery of habitats in which 100% mortality occurs, after degradation of oil allows recolonization, can only be estimated as 'several years'. In general, fish populations do not appear to be threatened by mortality resulting from oil spills although spawning grounds and larval nursery areas are considered more vulnerable than other regions. Birds appear to be one of the most vulnerable group of populations examined. Spills originating from hypothetical Atlantic offshore platforms are not expected to cause severe biological damage. Little can be said about the biological effects of oil spills occurring in the Gulf of Alaska as not much is known concerning distributions or populations. Large levels of uncertainty exist in all phases of the analysis. Insufficient baseline data exists for all regions which indicates the need for extensive research. (See also W76-11947) (Sinha - OEIS)
W76-11952

OCS OIL AND GAS - AN ENVIRONMENTAL ASSESSMENT. A REPORT TO THE PRESIDENT BY THE COUNCIL ON ENVIRONMENTAL QUALITY, VOL 5, SIMULATION OF HYPOTHETICAL OFFSHORE PETROLEUM DEVELOPMENTS.
Massachusetts Inst. of Tech., Cambridge, Mass.
Vol 5 for sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402, Price $6.50. April 1974. 78 p, 14 fig, 12 tab, 11 ref.

Descriptors: *Resources development, *Environmental effects, *Economics, *Computer programs, *Computer models, Leases, Drilling, Offshore platforms, Pipelines, Continental Shelf, Costs, Economic prediction.
Identifiers: *Outer Continental Shelf, *Offshore technology, Environmental impact, Oil and gas production, Underwater pipelines, Tankers.

The second report in Volume 5 of the CEQ's Report to the President describes estimates of the amount and type of development activity which would be engendered by a series of hypothetical finds on the outer continental shelf. As a function of the geological, locational, and financial/regulatory characteristics of a hypothetical find, interest is in the investors' development strategy, the resulting oil and gas production through time, the number of platforms, amount of drilling activity, and mode (pipeline or tanker) and amount of transport activity. The resulting landed cost of the oil and gas to the nation, the resulting investor profits and the resulting lease, royalty and tax payments are also of interest. To this end, a computer program known as the Offshore Development Model was constructed, tested, and exercised over a large number of possible finds. Some of the results are as follows: For finds at the outer limits of the continental shelf, the program always favors tankers over pipelines for the delivery of oil to shore. For finds 36 miles offshore or less, the program favors pipelines. Variation in price has almost no effect of developer strategy as long as the field can be profitably developed over the range of the variation. The program results are insensitive to variation in reservoir parameter other than oil and gas in place and investor profits and national cost can be sensitive to these variables. The maximum rates at which platforms can be installed can be an extremely important variable in determining the profitability of very large finds. (See also W76-11947) (Sinha - OEIS)
W76-11953

OCS OIL AND GAS - AN ENVIRONMENTAL ASSESSMENT. A REPORT TO THE PRESIDENT BY THE COUNCIL ON ENVIRONMENTAL QUALITY, VOL 5, ANALYSIS OF OIL SPILL STATISTICS.
Massachusetts Inst. of Tech., Cambridge, Mass.
Vol 5 for sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D C 20402, Price $6.50 April 1974. 126 p, 57 fig, 13 tab, 13 ref

Descriptors *Oil spills, *Oil pollution, *Environmental effects, *Estimating, *Evaluation, Forecasting, Data collections, Water quality control, Continental Shelf, Resources development, Exploration, Water pollution sources, Offshore platforms, Pipelines, Probability.
Identifiers: *Outer Continental Shelf, Offshore technology, Environmental impact, Tankers, Offshore production, Mooring, Terminals, U S, Atlantic Coast, Gulf of Alaska.

The third report in Volume 5 of the CEQ's Report to the President describes the analysis to utilize past spill experience to generate estimates of the likelihood of spillage by number and size of individual spill for a range of hypothetical offshore petroleum developments on the Atlantic and Gulf of Alaska continental shelf. Estimates of the numbers and sizes of individual spills are at least as important as estimates of the total volume spilled. The way to attack oil spill statistics is through a two-step process: how many spills will occur, and how much oil will be spilled in an individual spill. Spillage is divided into five categories: tankers and barges, onshore terminals, single buoy moorings, offshore production, offshore pipelines. From the biological point of view, the frequency and magnitude of individual spills is at least as important as total spillage. Therefore estimates are given of the probability densities of the number of spills of a given category which will occur from a given hypothetical development and the probability density of the size of these spills. The estimates of probabilities given can reasonably be regarded as moderately pessimistic. They assume no improvement in technology or operations over the recent past. (See also W76-11947) (Sinha - OEIS)
W76-11954

OCS OIL AND GAS - AN ENVIRONMENTAL ASSESSMENT. A REPORT TO THE PRESIDENT BY THE COUNCIL ON ENVIRONMENTAL QUALITY, VOL 5. OIL SPILL TRAJECTORY STUDIES FOR ATLANTIC COAST AND GULF OF ALASKA.
Massachusetts Inst. of Tech., Cambridge, Mass.
Vol 5 for sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402, Price $6.50. April 1974. 189 p, 117 fig, 15 tab, 28 ref.

Descriptors: *Oil spills, *Oil pollution, *Water quality control, *Water pollution sources, Resources development, Atlantic Ocean, Alaska, Wind, Waves(Water), Currents(Water), Assessments, Continental Shelf, Forecasting, Weathering, Drift(Aquatic).
Identifiers: *Outer Continental Shelf, *Environmental impact, *Offshore technology, Gulf of Alaska, U. S. Atlantic Coast, Buzzards Bay, Delaware Bay, Charleston Harbor, Terminals.

The fourth report in Volume 5 of the CEQ's Report to the President describes how oil spills can be transported many miles from the site of an accident by the action of wind, waves, and current. The purpose of this study was to obtain insight into the likely behavior of oil spill trajectories emanating from each of the thirteen potential Atlantic outer continental shelf production regions. In addition the likely behavior of oil spills emanating from three potential nearshore terminal areas, Buzzards Bay, Delaware Bay, and Charleston Harbor was examined. Major emphasis in all the analyses was placed on the probability of a spill coming ashore, the time to shore, and, in the case of the terminal analyses, the wind conditions at the time the spill first reaches shore. The analysis dealt solely with the problem of determining where the spill would go due to the combined actions of the wind, waves and currents. There are, however, natural processes that, given sufficient time, te

mitigate the effect of a spill upon beaching on a
ast or entering an estuary. These processes are
ncipally the evaporation of the lighter fractions
o the atmosphere, the dissolution of the soluble
ction into the water, and the breakdown of the
ger oil slicks into ever smaller and more nu-
rous patches by the action of the ambient turbu-
ce. (See also W76-11947) (Sinha - OEIS)
6-11955

VIRONMENTAL LAW--STATUTORY IN-
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CLEAR AGE--COLORADO PUBLIC IN-
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-11979

SETTLEMENT OF INTERNATIONAL EN-
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primary bibliographic entry see Field 6E.
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BIOLOGICAL BACKGROUND FOR IN-
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EEDOM OF NAVIGATION AND THE
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tvennyi Proektno-Izyskatelskii i
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ry bibliographic entry see Field 5G.
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RESPONSIBILITY AND LIABILITY FOR HARM TO THE MARINE ENVIRONMENT,
International Inst. for Environment and Development, Washington, D.C. North American Office.
For primary bibliographic entry see Field 5G.
W76-12012

THE ROLE OF NORTH AMERICAN DEEP WATER PORTS,
For primary bibliographic entry see Field 5G.
W76-12015

PREPARING TO TAKE THE PLUNGE (ATLANTIC OFFSHORE OIL),
For primary bibliographic entry see Field 5G.
W76-12019

WORLD ENVIRONMENTAL QUALITY.
Department of State, Washington, D.C.
Available from the Supt. of Documents, GPO, Washington, DC 20402, Price $0.65. Dept of State Pub 8730, Gen For Policy Series 280, (October 1973), Office of Media Services, Bureau of Pub Affairs. 39 p, 23 photo, 1 chart.

Descriptors: *International law, *Administrative agencies, *International commissions, *Law of the sea, *Environmental control, Environmental effects, Federal government, Legislation, State governments, Governmental interrelations, Political aspects, Water law, Water pollution, Programs, Regulations, Law enforcement, Costs, Economics, Foreign trade, International waters, Air pollution, Conservation, Oil spills, Oil pollution.
Identifiers: *Earthwatch, *National Environmental Policy Act.

This pamphlet summarizes the activities and programs that various nations have undertaken to protect and control common world environmental needs. The United States, for example, has shouldered its national and international environmental responsibilities by enacting the National Environmental Policy Act of 1969, and by participating in the First United Nations Conference on the Human Environment. Other nations have organized bilateral arrangements, regional organizations, and scientific and other non-governmental bodies to meet international environmental problems. These organizations have realized that new research, better information exchange processes, global monitoring, and training and education programs are needed for effective environmental control. The two largest, most advanced development and assistance agencies are the International Bank for Reconstruction and Development (IBRD), and the Agency for International Development (AID). The activities of these agencies are examined here, as well as recent developments in a project known as 'Earthwatch' which embodies various international environmental control aims. (Hadoulias-Florida)
W76-12037

EBB AND FLOW: NAVIGABILITY AND THE CORPS OF ENGINEERS WASHED IN THE TIDE OF ENVIRONMENTAL PROTECTION,
Spessard L. Holland Law Center, Gainesville, Fla.
For primary bibliographic entry see Field 6E.
W76-12043

A SURVEY OF THE VARIOUS STATE POWER PLANT SITING LAWS,
Spessard L. Holland Law Center, Gainesville, Fla.
For primary bibliographic entry see Field 6E.
W76-12050

FEDERAL REGULATION IN THE LICENSING OF NUCLEAR POWER PLANT FACILITIES,
Spessard L. Holland Law Center, Gainesville, Fla.
For primary bibliographic entry see Field 6E.
W76-12051

RESIDENTIAL DEVELOPMENT A LOOK AT THE REGULATORY CONTROLS OF FLORIDA'S WATER RESOURCES,
Spessard L. Holland Law Center, Gainesville, Fla.
For primary bibliographic entry see Field 6E.
W76-12057

DUCK RIVER PRESERVATION ASSOCIATION V TVA (ENVIRONMENTAL IMPACT STATEMENTS AND USE OF THE RIVER).
For primary bibliographic entry see Field 6E.
W76-12080

7. RESOURCES DATA

7A. Network Design

PRELIMINARY EVALUATION OF THE GROUND-WATER DATA NETWORK IN INDIANA,
Geological Survey, Indianapolis, Ind.
J. R. Marie.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-251 690, $4.50 in paper copy, $3.00 in microfiche. Water-Resources Investigations 76-24, Marroject planning, *Indiana, Project feasibility, Project benefits, Costs, Water wells, Observation wells, Water levels, Water quality.

Descriptors: *Groundwater resources, *Data collections, *Information retrieval, *P
Identifiers: Data dissemination.

The groundwater data program, which was established in Indiana in 1935, has utilized 478 different wells located in every county in the State. More than half the counties have had more than four active wells, and one county has had 32. Water-level data have been collected on a periodic basis from 468 of these wells. The length of record available for individual wells ranges from 1 year to more than 38 years, with an average length of record of more than 9 years. To date, aside from water-level records of various types published for selected wells and the hydrographs kept in the files of the U.S. Geological Survey (copies of the hydrographs are furnished to the cooperator), no data compilations are available. The main purpose of this report is to make a preliminary evaluation of the network and to suggest methods suitable for a future in-depth study. (Woodard-USGS)
W76-11684

7B. Data Acquisition

DEVELOPMENT OF INSTRUMENTATION FOR A WATER PROCESSING ELEMENT,
Life Systems, Inc., Cleveland, Ohio.
For primary bibliographic entry see Field 5D.
W76-11666

A LAND USE AND LAND COVER CLASSIFICATION SYSTEM FOR USE WITH REMOTE SENSOR DATA,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 4A.
W76-11679

EARLY DETECTION AND CORRECTION OF SINKHOLE PROBLEMS IN ALABAMA, WITH A PRELIMINARY EVALUATION OF REMOTE SENSING APPLICATIONS,
Geological Survey, Tuscaloosa, Ala.
J. G. Newton.
Alabama Highway Research, Montgomery HPR Report No 76 (Research Project 930-070), January 1976. 83 p, 49 fig, 3 tab, 38 ref.

Descriptors: *Sinks, *Carbonate rocks, *Land subsidence, *Highways, *Alabama, Datacollec-

tion, Evaluation, Remote sensing, Aerial photography, Design criteria, Roads, Construction, Hydrogeology, Groundwater movement.

Recent sinkhole activity in Alabama has resulted in costly damage to highways and other structures, major pollution, and accidents. Sinkholes are divided into two categories defined as 'induced' and 'natural.' Induced sinkholes are those related to man's activities whereas natural sinkholes are not. Induced sinkholes develop in a much shorter timespan than natural sinkholes. The development of both categories is dependent on some degree of solution of carbonate rocks. Induced sinkholes are divided into types, those resulting from a decline in the water table due to ground-water withdrawals and those resulting from construction. It is estimated that more than 4,000 of these sinkholes, areas of subsidence, or related features have formed in Alabama since 1900. Many sinkholes develop with little or no warning, others are preceded by the formation of recognizable features that can be observed on the ground and from the air. Photographs, and other remote sensing data, are useful in the location and evaluation of potential sinkhole problems along planned highway corridors. (Woodard-USGS)
W76-11688

METHODS FOR COMPUTING THE EVAPORATION OF LAKE FERTOE, (IN GERMAN),
Orszagos Meteorologiai Intezet, Budapest (Hungary). Zentralanst. Atmos. Phys.
For primary bibliographic entry see Field 2D.
W76-11741

THE HYPSOMETRIC INTEGRAL AND LOW STREAMFLOW IN TWO PENNSYLVANIA PROVINCES,
Brooklyn Coll., N. Y. Dept. of Geology.
For primary bibliographic entry see Field 2A.
W76-11743

THE DEGREE OF COMMON ORIENTATION OF HYDROMETEORS OBSERVED BY POLARIZATION DIVERSITY RADARS,
National Research Council of Canada, Ottawa (Ontario).
For primary bibliographic entry see Field 2B.
W76-11745

MEASUREMENT OF LAKE ICE THICKNESS WITH A SHORT-PULSE RADAR SYSTEM,
National Aeronautics and Space Administration, Cleveland, Ohio. Lewis Research Center.
D. W. Cooper, R. A. Mueller, and R. J. Schertler.
NASA Technical Note D-8189, March 1976. 23 p, 16 fig, 5 ref, 1 append.

Descriptors: *Ice cover, *Lake ice, *Remote sensing, Radar, Instrumentation, Lakes, Measurement, Ice, Ice-water interfaces, Surveys, Aircraft, Data processing, Microwaves, Equipment.
Identifiers: *Ice thickness.

Measurements of lake ice thickness were made during March 1975 at the Straits of Mackinac by using a short-pulse radar system aboard an all-terrain vehicle. These measurements were compared with ice thickness determined with an auger. Over 25 sites were explored which had ice thicknesses in the range 29 to 60 cm. The maximum difference between radar and auger measurements was less than 9.8 percent. The magnitude of the error was less than + or - 3.5 cm. The NASA operating short-pulse radar system used in monitoring lake ice thickness from an aircraft was also described. (Sims - ISWS)
W76-11753

APPLICATION OF REMOTELY SENSED MULTISPECTRAL DATA TO AUTOMATED ANALYSIS OF MARSHLAND VEGETATION,
National Aeronautics and Space Administration, Houston, Tex. Lyndon B. Johnson Space Center.
For primary bibliographic entry see Field 2L.
W76-11754

DEVELOPMENT OF AN AIRBORNE LASER BATHYMETER,
National Aeronautics and Space Administration, Wallops Island, Va. Wallops Flight Center.
H. H. Kim, P. O. Cervenka, and C. B. Lankford.
NASA Technical Note D-8079, October 1975. 39 p, 18 fig, 7 tab, 8 ref, 2 append.

Descriptors: *Bathymetry, *Equipment, *Instrumentation, Oceans, Depth, Sounding, Measurement, Aircraft, Surveys, Contours, Coasts, Oceanography.
Identifiers: *Airborne laser bathymeters.

An airborne laser depth sounding system was built and taken through a complete series of field tests. Two green laser sources were tried: a pulsed neon laser at 540 nm and a frequency-doubled Nd:YAG transmitter at 532 nm. To obtain a depth resolution of better than 20 cm, the pulses had a duration of 5 to 7 nanoseconds and could be fired up to at rates of 50 pulses per second. In the receiver, the signal was detected by a photomultiplier tube connected to a 28 cm diameter Cassegrainian telescope that was aimed vertically downward. At 200 hours of flight time on the NASA C-54 airplane in the area of Chincoteague, Virginia, the Chesapeake Bay, and in Key West, Florida, yielded information on the actual operating conditions of such a system and helped to optimize the design. The maximum depth attainable in a mission can be predicted by measuring the effective attenuation coefficient in flight. This quantity is four times smaller than the usual narrow beam attenuation coefficient. Several square miles of a varied underwater landscape have also been mapped. Such a system can be either used alone in a scanning device or in conjunction with aerial photography to serve as reference. In either case, it promises great savings in time and expense over the usual sounding techniques. (Sims - ISWS)
W76-11755

PRACTICAL APPLICATIONS OF SPACE SYSTEMS.
National Research Council, Washington, D. C. Space Applications Board.
For primary bibliographic entry see Field 4A.
W76-11756

PRACTICAL APPLICATIONS OF SPACE SYSTEMS, SUPPORTING PAPER 3, LAND USE PLANNING.
National Research Council, Washington, D. C. Panel on Land Use Planning.
For primary bibliographic entry see Field 4A.
W76-11757

PRACTICAL APPLICATIONS OF SPACE SYSTEMS, SUPPORTING PAPER 5, INLAND WATER RESOURCES.
National Research Council, Washington, D. C. Panel on Inland Water Resources.
For primary bibliographic entry see Field 4A.
W76-11758

PRACTICAL APPLICATIONS OF SPACE SYSTEMS, SUPPORTING PAPER 6, EXTRACTABLE RESOURCES.
National Research Council, Washington, D. C. Panel on Extractable Resources.
For primary bibliographic entry see Field 4A.
W76-11759

PRACTICAL APPLICATIONS OF SPACE SYSTEMS, SUPPORTING PAPER 7, ENVIRONMENTAL QUALITY.
National Research Council, Washington, D. C. Panel on Environmental Quality.
For primary bibliographic entry see Field 4A.
W76-11760

ENGINEERING USES OF EROS,
Washington Univ., Seattle. Dept. of Electrical Engineering.
J. E. Colcord, and H. Bernath
Available from the National Technical Information Service, Springfield, Va 22161 as PB-242 108, $7.50 in paper copy. $3.00 in microfiche. Report USGS-LI-75-001, September 1974. 166 p, 69 fig, 30 tab, 53 ref. USGS 14-08-0001-12865.

Descriptors: *Remote sensing, *Instrumentation, *Data processing, Satellites(Artificial), Aerial photography, Geology, Hydrology, Mapping, Surface waters, Floods, Snow cover, Engineering, Engineering geology, Land use, Analytical techniques.
Identifiers: *ERTS, *EROS.

Problems of multi-spectral imagery and viewing systems were discussed in both their independent and supplemental role to available ERTS-1 imagery. The main concern was defined in the scope of the term 'engineering uses' and considered the problems of: (1) instrumentation, (2) prediction of ground reflectance from image measurement, (3) physical accuracy of scene geometry, (4) application of ERTS and M/S imagery to water/land boundary and run-off problems, (5) application of ERTS imagery to geological engineering and considerations in major siting problems, and (6) scene changes with time and other engineering data. (Sims-ISWS)
W76-11765

REMOTE SENSING CENTER GRANT PROGRAM SUMMARY,
Texas A and M Univ., College Station, Remote Sensing Center.
Available from the National Technical Information Service, Springfield, Va 22161, as N75-20799, $4.50 in paper copy, $3.00 in microfiche. Technical Activity Report RSC-08, February 1975. 66 p, 14 fig. NASA NGL 44-001-001.

Descriptors: *Remote sensing, *Projects, *Data processing, *Texas, Vegetation, Crops, Plant diseases, Aquatic plants, Oil spills, Range management, Forests, Crop production, Reservoirs, Soil moisture, Analytical techniques, Aerial photography, Satellites(Artificial), Microwaves, Monitoring.

The objective of the six-month program reported in this summary was to focus the efforts of the NASA grant projects of the Remote Sensing Center on concise demonstrations of the remote sensing techniques and technology developed at Texas A and M University. Several of these projects were documented in this report. These projects included enforcing the quarantine of diseased crops, improving vegetation utilization in urban planning, assisting aquatic plant monitoring and control, continuous area surveillance of oil spills, improving the management of Texas rangelands and increasing the productivity of crops in Texas. This summary also discussed the applications and supporting technology activities of the grant program from which the demonstration projects have evolved. A list of publications under this grant was included. (Sims - ISWS)
W76-11766

USE OF MULTISPECTRAL PHOTOGRAPHY IN WATER RESOURCES PLANNING AND MANAGEMENT IN NORTH CAROLINA,
North Carolina State Univ., Raleigh. Dept. of Geosciences.
For primary bibliographic entry see Field 5A.

6-11773

AVEL TIMES AND NONLINEARITY OF OOD RUNOFF FROM TRACER MEASURE-NT ON A SMALL WATERSHED,
w South Wales Univ., Kensington (Australia), ool of Civil Engineering.
primary bibliographic entry see Field 2E.
6-11850

SERVATIONS IN HAILSTORMS USING THE AIRCRAFT SYSTEM,
th Dakota School of Mines and Technology, id City. Inst. of Atmospheric Sciences.
primary bibliographic entry see Field 2B.
-11851

ELOPMENT OF THE UNIVERSITY OF VAII-MANOA STREAM GAGING STA-N,
aii Univ., Honolulu. Water Resources arch Center.
primary bibliographic entry see Field 4A.
11876

Evaluation, Processing and ublication

PUTER AIDED PLANNING OF A RE-AL DISPOSAL SYSTEM FOR MUNICIPAL GE,
P Engineers, Kitchener (Ontario).
imary bibliographic entry see Field 5D.
1647

ACE WATER SUPPLY OF THE UNITED ES, 1966-70: PART II. PACIFIC SLOPE IS IN CALIFORNIA--VOLUME I. BASINS TIJUANA RIVER TO SANTA MARIA t,
gical Survey, Reston, Va.
ble from Supt. of Documents, GPO, Wash., 0402, price $5.00. Water-Supply Paper 2128, 52 p, 3 fig.

ptors: *Surface waters, *Basic data collec-*Streamflow, *Reservoir storage, *Lakes, rnia, Gaging stations, Flow measurement, ates, Average flow, Hydrologic data, Water Low flow.
ers: Maximum discharges, Minimum ges.

port is one of a series of 37 reports present-rds of stage and discharge of streams, and and contents of lakes and reservoirs in the States during the 1966-70 water years; it s the records for gaging stations and par-rd stations in the Pacific slope basins in ia from Tijuana River to Santa Maria his report is one of the second series of pply papers to be published on a 5-year he first series covered the 5-year period 1, 1960, to September 30, 1965. This se-ers the period October 1, 1965, to Sep-0, 1970. The daily table for stream-gaging gives the mean discharge for each day and ed by monthly and yearly summaries of average, maximum, and minimum es. (Woodard-USGS)
69

SHOWING SELECTED EXTREME-IFLOW STATISTICS AND DRAINAGE GREATER PITTSBURGH REGION, LVANIA,
l Survey, Harrisburg, Pa.
l, Jr., and R. M. Beall.
report 76-350, April 1976. 1 sheet, 2 ref.

Descriptors: *Floods, *Peak discharge, *Flood recurrence interval, *Drainage area, *Maps, Streams, River basins, Gaging stations, Sites, Hydrologic data, Data collections.
Identifiers: *Greater Pittsburgh Region(Pa).

This map serves as a summary guide to extreme-flow statistics and drainage-area data for streams in the Greater Pittsburgh Region, Pa. Peak flood discharges of 100-year (or 50-year) recurrence interval and 7-day, 10-year low-flow discharges are shown for gaging sites for which there are sufficient streamflow records. Drainage-area values are given for all stream-gaging sites and for all named streams draining more than 3 square miles. (Woodard-USGS)
W76-11671

GROUND-WATER LEVELS IN SELECTED BASINS IN THE STATE OF UTAH FROM FEBRUARY-MARCH 1974 TO FEBRUARY-MARCH 1975,
Geological Survey, Salt Lake City, Utah.
Geological Survey map report, 1975. 19 maps.

Descriptors: *Water levels, *Groundwater, *Utah, *Maps, *Water level fluctuations, Basic data collections, Hydrologic data, Aquifers.

Ground-water levels in Utah were generally somewhat lower in February-March 1975 than a year earlier. In much of Pavant Valley and in parts of all major valleys in the northern two-thirds of the state, however, rising water levels were observed. Maps show the amount of water-level change in selected basins from February-March 1974 to February-March 1975 in the following counties: Salt Lake, Juab, Box Elder, Weber, Davis, Beaver, Tooele, Sevier, Millard, Utah, Iron, Cache, Sanpete, and Washington. The maps were prepared as part of a cooperative program of water-resources investigationds in Utah by the Utah Department of Natural Resources, Division of Water Rights, and the U. S. Geological Survey. (Woodard-USGS)
W76-11678

A LAND USE AND LAND COVER CLASSIFICATION SYSTEM FOR USE WITH REMOTE SENSOR DATA,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 4A
W76-11679

SEEPAGE STUDY OF THE ROCKY POINT CANAL AND THE GREY MOUNTAIN-PLEASANT VALLEY CANAL SYSTEMS, DUCHESNE COUNTY, UTAH,
Geological Survey, Salt Lake City, Utah.
For primary bibliographic entry see Field 4A.
W76-11682

PRELIMINARY EVALUATION OF THE GROUND-WATER DATA NETWORK IN INDIANA,
Geological Survey, Indianapolis, Ind.
For primary bibliographic entry see Field 7A.
W76-11684

INDEX OF CURRENT WATER RESOURCES PROJECTS AND DATA COLLECTION ACTIVITIES IN OHIO, WATER YEAR 1976,
Geological Survey, Columbus, Ohio.
Geological Survey Project Report, November 1975. 4 p, 2 parts, 2 tab.

Descriptors: *Indexing, *Projects, *Water resources, *Ohio, Surface waters, Groundwater resources, Water quality, Flood plains, Data collections, Methodology, Monitoring, Sampling, Sites, Projections, Planning, Documentation.

This index of water-resources program in Ohio for the 1976 water year (October 1, 1975 - September 30, 1976) consists of two parts: Part A - a listing of current projects and Part B - a listing of hydrologic data-collection stations. Part A contains information concerning the status of all projects in which there will be any activity during water year 1976. Added to these are all new projects proposed for implementation in water year 1976. Part B contains tables showing station numbers and names, types of data collected, and projects benefiting from the data collected at the site. (Woodard-USGS)
W76-11685

TRADE-OFF BETWEEN MODELS AND INFORMATION IN RIVER BASIN PLANNING,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources; and Arizona Univ., Tucson. Dept. of Systems and Industrial Engineering.
For primary bibliographic entry see Field 4A.
W76-11702

FLOOD CONTROL DESIGN WITH LIMITED DATA - A COMPARISON OF THE CLASSICAL AND BAYESIAN APPROACHES,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W76-11703

APPLICATION OF REMOTELY SENSED MULTISPECTRAL DATA TO AUTOMATED ANALYSIS OF MARSHLAND VEGETATION,
National Aeronautics and Space Administration, Houston, Tex. Lyndon B. Johnson Space Center.
For primary bibliographic entry see Field 2I.
W76-11754

PRACTICAL APPLICATIONS OF SPACE SYSTEMS.
National Research Council, Washington, D. C. Space Applications Board.
For primary bibliographic entry see Field 4A
W76-11756

PRACTICAL APPLICATIONS OF SPACE SYSTEMS, SUPPORTING PAPER 3, LAND USE PLANNING.
National Research Council, Washington, D. C. Panel on Land Use Planning.
For primary bibliographic entry see Field 4A.
W76-11757

ENGINEERING USES OF EROS,
Washington Univ., Seattle. Dept. of Electrical Engineering.
For primary bibliographic entry see Field 7B.
W76-11765

REMOTE SENSING CENTER GRANT PROGRAM SUMMARY,
Texas A and M Univ., College Station. Remote Sensing Center.
For primary bibliographic entry see Field 7B.
W76-11766

RELATING ENVIRONMENTAL MODELING TO POLICY ISSUES AND DECISIONS,
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-11879

SOME ASPECTS OF MODELLING THE LONG-TERM BEHAVIOUR OF AQUATIC ECOSYSTEMS,
Technical Univ. of Denmark, Lyngby. Inst. of Mathematical Statistics and Operations Research.
For primary bibliographic entry see Field 5B.
W76-11883

A COMPUTER SIMULATION TECHNIQUE FOR OIL SPILLS OFF THE NEW JERSEY-DELAWARE COASTLINE,
Coast Guard Research and Development Center, Groton, Conn.
For primary bibliographic entry see Field 5B.
W76-11940

OCS OIL AND GAS - AN ENVIRONMENTAL ASSESSMENT. A REPORT TO THE PRESIDENT BY THE COUNCIL ON ENVIRONMENTAL QUALITY, VOL 5, SIMULATION OF HYPOTHETICAL OFFSHORE PETROLEUM DEVELOPMENTS.
Massachusetts Inst. of Tech., Cambridge, Mass.
For primary bibliographic entry see Field 6G.
W76-11953

RELATIONS BETWEEN PROJECT ECONOMICS AND HYDROLOGICAL DATA,
Economic Commission for Europe(UN), New York.
For primary bibliographic entry see Field 6B.
W76-11970

OPTIMIZATION OF WATER RESOURCES DEVELOPMENT PROJECTS IN CASE OF INADEQUATE HYDROLOGIC DATA,
Research Inst. for Water Resources Development, Budapest (Hungary).
For primary bibliographic entry see Field 6A.
W76-11971

HYDROLOGICAL DATA--(COLLECTION, RECORDING DISTRIBUTION AND USE).
For primary bibliographic entry see Field 6E.
W76-12072

RECORDING OF AERIAL PHOTOGRAPHS OR MAPS.
For primary bibliographic entry see Field 6E.
W76-12096

SURVEILLANCE IN WATER QUALITY MANAGEMENT,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5G.
W76-12148

8. ENGINEERING WORKS

8A. Structures

CONSTRUCTION SAFETY IN WATERWORKS,
Construction Safety Association of Ontario, Toronto, Ontario.
For primary bibliographic entry see Field 5F.
W76-11651

UD METHOD OF RESERVOIR FLOOD ROUTING.
Soil Conservation Service, Washington, D.C. Engineering Div.
For primary bibliographic entry see Field 8B.
W76-11761

MINIMUM REQUIREMENTS FOR DESIGN, SUBMISSION OF PLANS AND SPECIFICATIONS OF SEWAGE WORKS.
Arizona State Dept. of Health Services, Phoenix.
For primary bibliographic entry see Field 5D.
W76-11893

HOW TO BUILD A FLOATING SCRAP TIRE BREAKWATER,
Rhode Island Univ., Narragansett. Dept. of Ocean Engineering and Marine Advisory Service.
For primary bibliographic entry see Field 8G.
W76-11944

THE WORLD'S LARGEST WATER PROJECT,
For primary bibliographic entry see Field 4A.
W76-12023

8B. Hydraulics

PRESSURES OF THERMAL ORIGIN EXERTED BY ICE SHEETS UPON HYDRAULIC STRUCTURES,
Laval Univ., Quebec. Lab. of Ice Mechanics.
For primary bibliographic entry see Field 2C.
W76-11750

LOS ANGELES AND LONG BEACH HARBORS MODEL STUDY; REPORT 1, PROTOTYPE DATA ACQUISITION AND OBSERVATIONS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab.
E. B. Pickett, D. L. Durham, and W. H. McAnally.
Available from the National Technical Information Service, Springfield, Va. 22161, as ADA012 147 $8.00 in paper copy, $3.00 in microfiche. Technical Report H-75-4, June 1975. 243 p, 9 fig, 9 tab, 14 plate, 16 ref, 12 append.

Descriptors: *Harbors, *Waves(Water), *California, Data collections, Measurement, Instrumentation, Surveys, Equipment, Investigations, On-site investigations, Hydrologic data, Ships, Currents(Water), Tides, Water levels, Hydraulics, *Model studies.
Identifiers: *Los Angeles Harbor(Calif), *Long Beach Harbor(Calif), Wave gages, Recording equipment, Ship motion.

This report describes the instrumentation, operation, calibration, and collected data of a 1-yr prototype wave, tide, and ship movement data acquisition program. From 1 June 1971 to 1 July 1972, wave data were obtained at 1-sec intervals from 13 wave gage stations at selected locations in the Los Angeles and Long Beach Harbors. Barometric pressure was monitored at the central receiving station onshore. In addition to wave data from pressure transducers, tidal height data were obtained from three float-type tide gages. For 15 stations in the harbors, tidal current measurements at three depths in the water column were collected at 1-hr intervals for a 25-hr observation period. In conjunction with wave measurements, data on ship characteristics, mooring configurations, and ship motion were collected and tabulated for vessels berthed in the east channel and west basin of Los Angeles Harbor and in the southeast basin and east basin of Long Beach Harbor. The purpose of the prototype wave observation program was to obtain for a 1-yr period continuous, accurate, and reliable wave data to be used in hydraulic and possibly mathematical models and in evaluating surge conditions in the existing harbors. Ship movement and mooring configuration data was collected to allow correlation of adverse ship motion with prototype wave conditions. Tidal height and currents were measured in the harbors area to provide data for physical hydraulic model verification and to aid identifying potential circulation problems. (Sims - ISWS)
W76-11751

CONSTRUCTION AND STABILIZATION OF COASTAL FOREDUNES WITH VEGETATION: PADRE ISLAND, TEXAS,
Texas Tech Univ., Lubbock. Dept. of Range and Wildlife Management.
For primary bibliographic entry see Field 2L.
W76-11752

UD METHOD OF RESERVOIR FLOOD ROUTING.
Soil Conservation Service, Washington, D.C. Engineering Div.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-244 622, $6.00 in paper copy, $3.00 in microfiche Technical Release No. 35, February 1967. 115 p, 3 fig, 82 chart.

Descriptors: *Reservoirs, *Flood routing, *Spillways, Charts, Hydraulic design, Design standards, Structures, Hydraulic structures, Engineering structures, Discharge(Water), Fluid mechanics, Hydraulics, Floodways, Overflow, Outlet works.
Identifiers: *UD method.

A rapid but accurate method of routing the emergency spillway and freeboard storms through reservoirs is important to determine the least costly proportions for floodwater-retarding or multiple-purpose structures. Many reservoir flood routing methods are available. However, each method has certain limitations. To overcome these limitations, the UD Method makes it possible to obtain in a few minutes a direct solution to the basic flood routing equation, inflow is equal to outflow plus the change in storage. It provides a means of investigating combinations of emergency spillway widths and maximum water surface elevations for any given emergency spillway crest elevation. It also makes it possible for the engineer to examine the effect of: (1) the principal spillway system, (2) the emergency spillway layout and design, (3) the velocity at the control section of the emergency spillway, and (4) the velocity in the exit channel of the emergency spillway. The answers obtained by the UD Method have been checked by the graphical flood routing procedure for a large number of sites. The results of the cases tested agreed almost exactly with the answers obtained from the graphical method. This release presents the theory, nomenclature, procedures, design charts, and examples of the method. Work sheets are included to facilitate the flood routing computations. (Sims-ISWS)
W76-11761

DRAG REDUCING POLYMER IN HELICOIDAL FLOW,
Johns Hopkins Univ., Baltimore, Md. Dept. of Mechanics and Materials Science.
J. T. Kuo, and L. S. G. Kovasznay.
Available from the National Technical Information Service, Springfield, Va 22161 as AD-A013 088, $4.00 in paper copy, $3.00 in microfiche. Technical Report No. 75-1, July 1975. 35 p, 14 fig, 7 ref, append. ONR N00014-67-A-0163-0002.

Descriptors: *Flow, *Drag, *Polymers, Laboratory tests, Mathematical models, Fluid mechanics, Hydraulics, Hydrodynamics, Model studies, Turbulence, Flow friction, Flow resistance, Chemicals, Organic compounds.
Identifiers: *Drag reduction, Dilute polymer solution, Helicoidal flow, Screw pumps.

A novel flow configuration was explored for the study of the behavior of drag reducing polymers. A screw pump consisting of a smooth cylinder and a concentrically placed screw was used to create a strongly three-dimensional but essentially laminar flow. In the first phase of the study, the static pressure head developed by the screw pump was measured as a function of polymer concentration (polyox 10 to 100 ppm). A large increase of the developed head was observed that behaved in an analogous manner to drag reduction as far as concentration, aging, and straining was concerned. In the second phase of the study a new apparatus was constructed and an additional parameter of a superimposed through flow was included and the degree of failure of the superposition principle was established. Sensitivity of the phenomenon to the pH value of the solution was also studied and the parameter again behaved similarly to the dr

ion. As a theoretical support of the effort, a mathematical model was explored based on o dimensional equivalent of the experiment uration. (Sims-ISWS)
1763

DEL OF TURBULENT DIFFUSION,
sche Hogeschool, Delft (Netherlands). of Civil Engineering; and Technische hool, Delft (Netherlands). Lab. of Fluid nics.
mary bibliographic entry see Field 2E.
770

N FACTORS FOR RIVER ICE BOOMS ZED,
nary bibliographic entry see Field 2C.
772

INJECTION INTO THE HAWAIIAN N-HERZBERG AQUIFER: A LABORA- STUDY USING A SAND-PACKED ULIC MODEL,
Univ., Honolulu. Water Resource h Center.
ary bibliographic entry see Field 5B.
77

FOR DAMPING WAVES,
Shipbuilding and Engineering Co. Ltd., apan). (Assignee).
, and M. Sasaki.
ent No. 3,953,977, 2 p, 2 fig, 6 ref; Official of the United States Patent Office, Vol , p 43, May 4, 1976.

ors: *Patents, *Waves(Water), Shore pro- Ocean waves, Energy, Erosion, Barriers, ing structures, Energy dissipation.
s: Wave damping.

for damping waves is comprised of an rame having a number of barriers and is the sea bottom so as to be downwardly gainst the wave in the sea water. An ame having a number of barriers is pro- the upper end of the inclined frame and ular to the plane of the inclined frame. ed frame is positioned in the area where istribution of the wave energy is most at the energy is effectively absorbed by rs. The inclined frame is downwardly inst the wave as beach so that the wave ver the frame is decreased and further the upright frame. The wave is effec- ped by the flexible barriers which ob- flow of water. Since the device is not af- he tide, the damping effect is not varied. prevents the mixing and change of sea the accumulation of sand or erosion of by wave. (Sinha - OEIS)

E-COMPLETION GEOTHERMAL PRODUCTION SYSTEMS,
Huisen.
No. 3,957,108, 6 p, 6 fig, 1 tab, 9 ref; zette of the United States Patent Of- 6, No 3, p 1061, May 18, 1976.

: *Patents, *Geothermal studies, Temperature, Heat exchangers, Ther- Energy, Wells, Drilling.

for the mining of geothermal energy a geothermal wells radiate from a single into a subsurface geothermal reser- lls can be drilled by conventional slant niques and each may contain a closed xchanger which receives water and eam. Some of the heat exchangers are ally and others are implanted horizon- ernating production of the wells in a programmed cyclical manner, convective movement of the hydrothermal fluid will occur within the geothermal zone. The generated steam is collected in a reservoir at the surface site and utilized to generate electricity. The condensate from the turbine can be recycled to the wells. Depending on the condition of the geothermal zone, the system may require further structure. In a wet geothermal zone, the fluid will operate as a carrier for the heat energy to deliver it to the surface under pressure. In the case of a dry geothermal zone or one containing insufficient pressure, the implantation of closed end heat exchangers at the ends of the wells requires means for conducting heat exchange fluid which may be connected to the turbine to return the condensate to the heat exchanger in a closed cycle loop. (Sinha - OEIS)
W76-11828

GRAVITY WAVES PROPAGATED OVER PERMEABLE BOTTOM,
Polish Academy of Sciences, Gdansk. Inst. of Hydraulic Research.
S. R. Massel.
Journal of the Waterways, Harbors and Coastal Engineering Division, American Society of Civil Engineers, Vol. 102, No. WW2, Proceedings Paper 12107, p 111-121, May 1976. 3 fig, 10 ref, 4 append.

Descriptors: *Gravity waves, *Waves(Water), *Coastal engineering, Porous media, Sands, Hydraulics, Wavelength, Foundations, Equations, Mathematical studies.
Identifiers: *Wave energy, *Wave-bottom interaction, Wave propagation, Damping, Forchheimer equation.

Based on Forchheimer equation and potential theory, the propagation of small amplitude surface waves over a permeable bed was examined. The special linearization technique that is based on the assumption of the equivalent work (Lorentz' hypothesis) was employed in order to determine analytically the velocity field and pressure field. Demanding the continuity of pressure and velocity components at the interface, the damping factor and wave number for arbitrary permeability were found. The example calculations showed that the influence of the permeability on the pressure distribution is negligibly small. (Lee - ISWS)
W76-11853

PARAMETERS AFFECTING STABILITY OF RUBBLE MOUNDS,
Norges Tekniske Hoegskole, Trondheim. Institutt for Anleggsdrift og Havnebygging.
P. Bruun, and P. Johannesson.
Journal of the Waterways, Harbors and Coastal Engineering Division, American Society of Civil Engineers, Vol. 102, No. WW2, Proceedings Paper 12136, p 141-164, May 1976. 28 fig, 5 tab, 29 ref.

Descriptors: *Breakwaters, *Harbors, *Jetties, *Sea walls, Equations, Permeability, Porosity, Friction, Waves(Water), Laboratory tests, Mathematical models.
Identifiers: *Rubble mounds, Rubble masonry, Blocks, Armors, Downrush, Uprush.

The hydraulic reasons for failure of rubble structures suggesting improvements in design methods are examined. The importance of forces by uprush and downrush, and forces depending upon friction and permeability was analyzed. The most dangerous combinations of these forces and of resonance between uprush/downrush period and wave period were evaluated. The conclusion was that armor units should be 'placed'. Impermeable sheets should be put in the upper as well as in the lower part of the slope. Furthermore the commonly used trapezoidal linear slope profile should be substituted by better reasoned design to obtain a greater degree of compatability between the wave action, slope geometry structure, and armor unit geometry. A 'self-adjusted' profile may be divided into three zones with different slope angle and block-characteristics and combined to achieve maximum stability. (Lee - ISWS)
W76-11854

ROUGHNESS EFFECTS ON RECTANGULAR FREE OVERFALL,
Alberta Univ., Edmonton. Dept. of Civil Engineering.
N. Rajaratnam, D. Muralidhar, and S. Beltaos.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 102, No. HY5, Proceedings Paper 12152, p 599-614, May 1976. 8 fig, 2 tab, 20 ref, 2 append.

Descriptors: *Flow measurment, *Roughness(Hydraulic), Open channel flow, Depth, Turbulent flow, Hydraulics, Equations, Hydraulic models, Model studies.
Identifiers: *Critical depth, Free overfall, Rough rectangular free overfall.

For a rectangular free overfall, the end depth ratio (EDR) has been well connected with the main parameters using dimensional analysis. Using experimental results on three different roughnesses, it has been found that the EDR can be predicted from the curve Delleur, et al., for smooth channels, if the relative roughness is less than about 0.1. If the relative roughness is greater than 0.1, then the EDR is reduced by the roughness and this effect has been correlated using the experimental results. A method has been proposed to predict the discharge from the measured end depth for a rough rectangular free overfall. (Lee-ISWS)
W76-11855

SAFETY FACTORS FOR RIPRAP PROTECTION,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
M. A. Stevens, D. B. Simons, and G. L. Lewis.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 102, No. HY5, Proceedings Paper 12115, p 637-655, May 1976. 7 fig, 22 ref, 1 append.

Descriptors: *Stream stabilization, *Riprap, *Stability, *Tractive forces, *Safety factors, *Slope stabilization, Flow, Velocity, Gradation, Design standards, Movement, Drag, Equations.
Identifiers: Lift force, Flow angularity.

The merit of a particular riprap design can be represented by numerical value of the riprap safety factor, defined as the ratio of moments resisting particle motion to the moments tending to rotate the particle out of the riprap blanket. A safety factor of unity denotes incipient motion. From theoretical considerations, a relation was established between the riprap safety factor and the magnitude and direction of the flow velocity in the vicinity of the riprap, the angle of the side slope, and the angle of repose for the riprap. The design procedures of the Corps of Engineers, the Bureau of Reclamation, the California Division of Highways, the Bureau of Public Roads and others were evaluated in terms of the riprap safety factor. Some of the designs have safety factors less than unity indicating that there could be a loss of riprap material when the design flows are obtained. (Lardner - ISWS)
W76-11856

TURBULENT ENTRAINMENT AT THE DENSITY INTERFACE OF A TWO-LAYER STABLY STRATIFIED FLUID SYSTEM,
Johns Hopkins Univ., Baltimore, Md., Dept. of Earth and Planetary Science.
For primary bibliographic entry see Field 2L.
W76-11871

DRILLERS STARTED AT THE BOTTOM AND WENT DOWN.
The Johnson Drillers Journal, Vol. 48, No. 3, p 7, May-June, 1976. 1 fig.

Descriptors: *Water wells, Drilling equipment, *Arizona, Drilling, Water yield, Drawdown.
Identifiers: *Grand Canyon(Ariz).

A water well was drilled at the bottom of the Grand Canyon in northwest Arizona by the Bureau of Indian Affairs, Southern Pueblos Agency, Rangewater Section. The well was drilled using a Bucyrus Erie 1W drilling rig which was disassembled and transported to the canyon floor by helicopter. Well screens were delivered to the well site by pack-horse following sample evaluation. The well was drilled in a fine riverbottom material to a depth of 90 feet with a 6 inch casing to 82 feet, 4 inch casing riser from 67 to 82 feet, and a 4 inch screen from 82 to 90 feet. The yield is 40 gallons per minute at 10 feet of drawdown. (Heiss-NWWA)
W76-11908

HOW TO DRILL A USABLE HOLE PART I - WHY DEVIATION OCCURS,
Drilco, Houston, Tex.
For primary bibliographic entry see Field 8G.
W76-11915

OFFSHORE SEDIMENT TRANSPORT AND EQUILIBRIUM BEACH PROFILES,
Waterloopkundig Laboratorium, Delft (Netherlands).
For primary bibliographic entry see Field 2L.
W76-11937

8C. Hydraulic Machinery

DRAG REDUCING POLYMER IN HELICOIDAL FLOW,
Johns Hopkins Univ., Baltimore, Md. Dept. of Mechanics and Materials Science.
For primary bibliographic entry see Field 8B.
W76-11763

POTENTIAL PUMPED STORAGE PROJECTS IN THE PACIFIC SOUTHWEST.
Federal Power Commission, Washington, D.C. Bureau of Power.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-242 798, $4.00 in paper copy, $3.00 in microfiche. Report, 1975. 37 p, 8 fig, 4 tab, 9 maps.

Descriptors: *Powerplants, *Pumped storage, *Sites, *California, *Arizona, *Nevada, *Utah, *Southwest US, Electric power, Electric powerplants, Hydroelectric power, Federal Power Act, Peak power, Dams, Reservoirs, Tunnels, Reservoir storage, Projects, Project planning, Reservoir sites.
Identifiers: *Potential sites.

About 400 possible pumped storage sites were identified from United States Geological Survey quadrangle maps covering the states of California, Arizona, Utah, and Nevada. About 245 sites, or over 60%, were eliminated because they did not meet the site selection criteria adopted for the study. These criteria were related to the following: (1) operating pattern, (2) plant size and characteristics, (3) topography, (4) reservoir size and characteristics, (5) conduit size and characteristics, (6) source of pumping energy and load center, and (7) areas excluded. The remaining 155 sites would have an ultimate installed capacity of 341,100 megawatts. Generating capacity of the plants ranged from a minimum of 1,000 megawatts (at all sites) to a maximum of 7,800 megawatts (at one site). (Sims-ISWS)
W76-11764

WAVE ENERGIZED PUMP,
H. Lloyd.
U.S. Patent No. 3,957,398, 3 p, 6 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 946, No 3, p 1156, May 18, 1976.

Descriptors: *Patents, *Water utilization, *Pumps, *Pumping plants, *Waves(Water), Pontoons, Fluctuations, Energy, Control systems, Water level.
Identifiers: Wave control.

A floating pumping apparatus of considerable length (600 ft) is provided which defines its own wave channel between two elongated pontoons. Pumps distributed along the channel are operated by a float which moves up and down in response to wave action within the channel. The pumps are all connected together in such a manner that a somewhat uniform output is obtained even though the wave action is not indentical at different parts of the channel. The pontoons are each cavitated or compartmented with a carefully controlled amount of ballast water in each compartment to lend stability to the entire assembly. The compartments as well as the pumps are fed from a common sump in which the level of the water is the same as that of the surrounding sea or lake. An adjustable baffle at at least one end of the channel controls the entry of waves into the channel in such a manner that the amplitude of the admitted waves, while not uniform, will be more or less controlled within limits of operability of the pumping apparatus. Double acting pumps are employed and the throw of the pump pistons can be adjusted as to the direction in which the pistons operate. (Sinha-OEIS)
W76-11831

SEWAGE TREATMENT METHOD AND APPARATUS,
ITT Industries, Inc., New York. (Assignee).
For primary bibliographic entry see Field 5D.
W76-11835

DEEP SEA TANK AND SEAPORT SYSTEM,
S. J. Memoli.
U.S. Patent No. 3,958,521, 5 p, 8 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 946, No 4, p 1543, May 25, 1976.

Descriptors: *Patents, *Offshore platforms, *Oil pollution, *Oil spills, Water pollution control, Resources development, Oil industry, Drilling, Barriers, Pipelines, Continental Shelf.
Identifiers: *Outer Continental Shelf, *Offshore technology, Seaports, Containment, Tankers.

A deep sea tank and seaport system is disclosed. The system includes deep sea tanks which provide a containment barrier surrounding one or more towers which function as a docking facility for oil tankers. The deep sea tanks are connected to a cable surrounding the tower, with an opening at either end of the tank arrangement to permit access by the oil tankers to the tower. The tower employs features which ensure a stabilized platform, while allowing easy access to the tankers. The tower is equipped with living and operational spaces for the crew, and a pipeline is provided to allow transfer of oil to the shore. The present system is advantageously employed around oil drilling rigs and in other environments in which it is desired to contain oil spills or other pollutants floating on the water. A skirt member interposed between adjacent tanks define the boundary of a containment area. Certain of the tanks can be anchored to the seabed. (Sinha-OEIS)
W76-11841

AT THE END OF YOUR ROPE...,
Paulsen Wire Rope Corp., Pittsburgh, Pa.
For primary bibliographic entry see Field 8G.
W76-11911

ACCESS SHAFTS POSED PROBLEMS,
The Johnson Drillers Journal, Vol 48, No. 3, p 8-9, May-June, 1976. 3 fig, 2 tab.

Descriptors: *Rotary drilling, *Boreholes, *Shafts(Excavations), Drilling equipment, Casings, Drilling fluids, Aquifers, Groundwater, Glacial drift, Storm drains, Minnesota
Identifiers: *Open-hole drilling, Large diameter core barrels, Pilot holes, St. Paul(Minnesota)

The Tri-State Drilling and Equipment Company of Hamel, Minnesota, constructed four vertical shafts for a storm sewer drainage system. The shafts ranged from 12 to 18 feet in diameter and 102 to 110 feet in depth. The excavations were constructed, using open-hole drilling methods and specially fabricated, large diameter core barrels. This unusual construction method was employed due to the presence of the water table at a depth of only 8 to 15 feet below the surface. The shafts penetrated 102 feet of glacial drift, into 20 feet of the Platteville limestone. For each shaft a 12 foot length of surface casing was set of a diameter a little larger than the finished borehole diameter. A 7 foot diameter pilot hole was then drilled into bedrock. This was then successively enlarged in stages by using several sizes of core barrels, each one from 12 to 24 inches larger than the preceeding tool. The borehole was kept full of bentonite drilling mud at all times to prevent caving and effectively seal any shallow aquifers encountered. Two Watson 5000 crane-attached drilling assemblies, stacked one above the other, provided the rotary motion and power for the core barrels. Tri-State equipment was on the job for about 3 months. (Heiss-NWWA)
W76-11913

VARIABLE SPEED PUMPING HAS MANY ADVANTAGES,
Moodys of Dayton, Inc., Miamisburg, Ohio.
C. R. Buck.
The Johnson Drillers Journal, Vol. 48, No. 3, p 13-14, May-June, 1976. 3 fig.

Descriptors: *Centrifugal pumps, *Pump turbines, *Water pumping, Water conveyance, Water wells
Identifiers: *Variable speed pumps, Constant speed pumps, Pump applications.

A pump is selected to meet a combination of pressure-discharge values as required for the specific water system. If the system demand changes substantially with respect to either total pressure or flow rate, a constant speed pump may not satisfy the systems water demand. Variable speed pumps, however, provide performance which satisfies changing system requirements, as well as the ability to adjust the control pressures and flow rates. Some of the advantages of variable speed operation over start-stop cycling are: extended equipment life, reduced voltage dips, reduced hydraulic surges, higher efficiency, reduced power consumption and less maintenance. The variable speed pump responds to changes in speed by the mechanisms: (1) flow rate varies directly with speed in rpm, (2) head varies with the square of the rpm change, (rpm1-rpm2)2, and3 3) power required varies with the cube of the rpm change, (rpm1-rpm2),. Most of the variable speed pump applications are designed to maintain constant pressure on both municipal and industrial water systems. (Heiss-NWWA)
W76-11914

PREVENTING LIGHTNING DAMAGE TO PUMPS.
For primary bibliographic entry see Field 8G.
W76-11917

IMPRESSION TOOL EVALUATES PERFORATION EFFECTIVENESS,
Standard Oil Co. of California, Western Operations, Inc., Oildale.
For primary bibliographic entry see Field 8G.

-11918

ICOPTER RIG CAN DRILL TO 20,000 T.
primary bibliographic entry see Field 8G.
-11920

Soil Mechanics

ER DRAINAGE FROM HIGHWAY FILLS,
as State Highway Commission, Topeka.
ing and Development Dept.
Clark, C. F. Crumpton, and W. J. Gilliland.
able from the National Technical Informa-
ervice, Springfield, Va 22161 as PB-241 790,
in paper copy, $3.00 in microfiche. Interim
t K-I-72-1, 1974. 40 p, 17 fig, 3 tab, 6 ref, 1
d.

iptors: *Drainage, *Landfills, *Highways,
slides, *Kansas, Subsurface waters, Sur-
unoff, Soil water, Drainage engineering, Dye
es, Drainage practices, Drainage systems,
ts, Burrows, Limestones, Soils, Soil stabili-
rthworks, Embankments, Soil mechanics,
onstruction, Soil stabilization, Vegetation.

has been found to be induced into highway
Kansas through cracks, rodent burrows,
owl or funnel shaped depressions in the
of four lane highways. Dye tracer studies
reased flow from special drains after rains
erified the primary water source as surface
Groundwater, however, has been found to
ute some water to the supply at one loca-
ne or more poorly consolidated layers of
ne blocks was found in each fill that was
in detail. These layers of rocks contained
pen space between blocks which act as a
ir for water moving into the fill. Over a
of several years the water gradually soaks
le and soil used in the fill embankment
; in unstable fill conditions especially
ith steep slopes. This in turn sometimes
n a fill slide. Special vertical and horizontal
ave been used to drain thousands of gal-
water from these fills thus improving the
A small volunteer growth of trees at one
has retarded sliding in spite of a large
uildup suggesting that these long known
stabilizers should be used more in en-
applications where they do not create
rd to the driving public. (Sims-ISWS)
52

EVALUATION OF A RECHARGE

k State Dept. of Transportation, Albany.
ng Research and Development Bureau.
ry bibliographic entry see Field 4B.
2

ck Mechanics and ogy

SHAFTS POSED PROBLEMS,
y bibliographic entry see Field 8C.
3

RACTURE TRACES TO LOCATE VELLS,
Water Well Association, Worthington,

y bibliographic entry see Field 8G.

8F. Concrete

FIELD PROVEN TECHNIQUES IMPROVE CEMENTING SUCCESS,
Exxon Co. Houston, Tex.
J. A. Holley.
World Oil, Vol. 183, No. 2, p 31-33, August, 1976. 1 fig, 2 tab, 2 ref.

Descriptors: *Grouting, *Cement, Drilling fluids, Oil wells, Slurries.
Identifiers: *Tubingless completions, *Conventional completions, *Reciprocation technique, Simultaneous rotation, Scatchers, Centralizers, Mixing techniques.

A successful cementing technique developed originally for 2 7/8 - inch tubingless completions, has been expanded to conventionally completed wells. The cementing methods that were utilized were divided into five primary categories: (1) cementing slurries; (2) mixing and displacement technique; (3) pipe movement; (4) mechanical aids attached to the pipe; (5) mud properties prior to cementing. The data indicated that the cementing procedures used were successful. In addition it was established that the technique of simultaneously rotating and reciprocating pipe while cementing is profitable for conventional completions, but is unnecessary for 2 7/8 - inch tubingless completions in 7 7/8 - inch holes. (Gass-NWWA)
W76-11909

8G. Materials

METHOD OF INHIBITING SCALE FOR HIGH TEMPERATURE STEAM WELLS,
Union Oil Co. of California, Brea. (Assignee).
H. E. Zilch, and P. W. Fischer.
U.S. Patent No. 3,958,635, 5 p, 9 ref; Official Gazette of the United States Patent Office, Vol 946, No 4, p 1581, May 25, 1976.

Descriptors: *Patents, *Geothermal studies, *Scaling, *Temperature, *Inhibition, Inhibitors, Chemical reactions, Ions, Alkaline earth metals, Wells.

The scale-forming ions most commonly found in geothermal fluids are the alkaline earth metal cations, such as calcium, magnesium, and barium and various anions such as carbonate, bicarbonate, sulfate, phosphate, oxalate and silicate. When combinations of these anions and cations are present in concentrations which exceed the solubility of their reaction product, precipitation of solids which build up to form scale will occur. To retard scale formation, a scale inhibitor must be mixed with the aqueous fluid before scale formation occurs. Thus, in some instances, it may be necessary to inject the inhibitor into the formation via the production well or via an offset well. A method of inhibiting the formation of scale from geothermal fluids having a temperature of 400 deg F. and above is to add a water-soluble substituted iminodi(methylene phosphonic acid) compound having a carbon-to-phosphorus bond or a water-soluble salt. The inhibitor can be added in concentrated form to the aqueous media containing the scale-forming ions or it can be utilized in the form of an aqueous solution. (Sinha-OEIS)
W76-11842

DRILLERS STARTED AT THE BOTTOM AND WENT DOWN.
For primary bibliographic entry see Field 8B.
W76-11908

FIELD PROVEN TECHNIQUES IMPROVE CEMENTING SUCCESS,
Exxon Co. Houston, Tex.
For primary bibliographic entry see Field 8F.
W76-11909

MOST JAMAICAN WATER COMES FROM LIMESTONE AQUIFERS,
National Water Authority of Jamaica (Kingston).
For primary bibliographic entry see Field 4B.
W76-11910

AT THE END OF YOUR ROPE...,
Paulsen Wire Rope Corp., Pittsburgh, Pa.
W. H. Myers.
Drilling-DCW, Vol. 37, No. 11, p 43-44, 74-76, August, 1976. 6 fig, 1 tab.

Descriptors: *Drilling equipment, Safety factors, Metals.
Identifiers: *Wire rope attachments, *Wire rope, Sockets, Splices, Swaged fittings, Clips, Clevises, Shackles.

Wire rope end attachments may be as important as the wire rope to which they are fastened. Users of wire rope must have a good working knowledge of the types of end attachments and understand how they affect rope serviceability. Efficiencies of the most widely used wire rope end attachments vary from 100 percent of rope nominal strength with Spelter sockets to 75 - 90 percent with Wedge sockets. Hand-tucked splices, Mechanical splices, Swaged steel fittings and Wire rope clips all fall between these limits. (Each fitting type has its individual advantages for specific jobs.) Specific designs of the terminal or combinations of fittings are infinite in their possibilities. Standard catalog items would include open and closed sockets, both poured and swaged, hooks, eyes, clevises, shackles, threaded studs, straight buttons, and turnbuckles. Each fitting type has its individual advantage for specific applications. The selection of an end attachment should involve careful considerations of its application requirements. (Heiss-NWWA)
W76-11911

ENCRUSTATION,
Plummer and McDannald Co., Galena, Ohio.
R. B. McDannald.
Water Well Journal, Vol. 30, No. 8, p 7, August, 1976.

Descriptors: *Corrosion, *Water wells, *Well screens, *Iron bacteria, Calcium carbonate, Manganese, Aerobic bacteria, Chlorination, Solubility, Groundwater, Shale, Gravel, Dissolved solids, Oxidation, Chemical precipitation, Aquifers.
Identifiers: *Encrustation, *Mineral encrustation, Manganic oxide, Taps, Pressure tanks, Pump columns, Connectors, Bacteria plugging, Pumping rates, Check valves, Pressure switches.

Encrustation, commonly confused with corrosion, is normally caused by a lowering of pressure in well water. Lowering of the pressure below normal static conditions tends to upset the equilibrium of the ground water's solubility, which in turn results in formation and precipitation of insoluble minerals. Iron bacteria, being aerobic are generally found in shallow wells. Bacterial plugging, is commonly caused by iron bacteria organisms which develop thread-like slime growths. These growths oxidize dissolved iron and manganese and accumulate large pods of rust in slime. To sustain growth, iron bacteria must have 1 ppm or more of iron or manganese. Iron problems can be controlled by the use of chlorine, although there is no permanent solution. To prevent spread into other wells, drilling tools should be rinsed off with chlorine solution. Also, each well should be chlorinated at the completion of any work. Insoluble minerals precipitate regardless of material and incrustation can build up on the gravel of the aquifer. Some steps to eliminate encrustation problems are: (1) provide open area in well screen to reduce velocity of water, (2) reduce drawdown to improve well efficiency by matching the pumping rate, (3) Use periodic chemical treatment, (4) keep oxygen away from affected area. (Grober-NWWA)
W76-11912

HOW TO DRILL A USABLE HOLE PART I - WHY DEVIATION OCCURS,
Drilco, Houston, Tex.
G. E. Wilson.
World Oil, Vol. 183, No. 2, p 40-43, August, 1976. 8 fig, 10 ref.

Descriptors: *Rotary drilling, *Wells, Oil wells, Drilling equipment.
Identifiers: *Drill collars, *Borehole deviation, Doglegs, Key seats, Drill pipe fatigue, Stuck pipe, Casing wear.

Crooked holes cause problems such as doglegs and key seats that can result in increased drilling costs, destroy drilling equipment and cause problems in production operations. The purpose of using drill collars is to increase the weight on the bit without applying compressive force to the drill pipe. Such forces when applied to a rapidly rotating string of pipe will result in premature pipe failure. While drill collars can help reduce crooked holes it does not entirely eliminate the problem. A number of theories were developed to explain borehole deviation. Robert S. Hock suggested that drilling with an unstabilized bit will result in hole deviation if hard ledges are encountered. H. E. Treichler theorized that the lateral movement of an unstabilized bit in non-dipping formations tends to cut a spiraled hole. The whiptoils theory was introduced by H. M. Rollins. It suggested that when formations dipping less than 45 are drilled, the bit may tend to drill updip which causes a deviated hole, resulting from the formation of whipstocks that develop between rock laminations. Regardless of the cause, hole deviation can result in drill pipe fatigue, stuck pipe, stuck logging tools, problems with setting casing, and production problems. (Gass-NWWA)
W76-11915

USING FRACTURE TRACES TO LOCATE WATER WELLS,
National Water Well Association, Worthington, Ohio.
T. E. Gass.
Water Well Journal, Vol. 30, No. 8, p 30-31, August, 1976.

Descriptors: *Fractures, *Permeability, *Joints geology, *Aerial photography, Alluvium, Water wells, Aquifers, Groundwater, Igneous rock, Metamorphic rock, Sedimentary rock, New York.
Identifiers: *Fracture zones, *Fracture traces, Consolidated rock, Siltstone, Adirondack Mountains(NY).

The techniques of using fracture traces in locating wells are by no means new. To understand fracture traces, you must first understand the concept of permeability. Permeability refers to the ease with which water flows through rock material. The permeability of a rock unit determines whether or not it will yield an adequate amount of water to a well. Among the factors affecting the permeability of a consolidated rock is the degree to which the rock is fractured. Fractures generally increase the permeability of an aquifer. Many metamorphic and igneous rocks and some sedimentary rocks such as siltstone and shale, will yield very low quantities of water unless fractures are encountered in the rock during drilling. Fractures increase the permeability of a rock by establishing passages or channels which provide less resistance to the flow of water than the surrounding rock. After understanding fractures, the next step relates to finding these fractures or fracture zones. The appearance of a fracture or fracture zone on the earth's surface is called a fracture trace. Using aerial photographs, fracture traces easily show up as dark, straight line segments; lines of darker soil caused by increased soil moisture; straight, narrow rows of vegetation; and as cracks on bedrock surfaces. Most evidence supports the conclusion that fracture traces, and underlying fracture zones, can be an important tool for ground water exploration. (Grober-NWWA)
W76-11916

PREVENTING LIGHTNING DAMAGE TO PUMPS.
Ground Water Age, Vol. 10, No. 11, p 27-29, July, 1976. 5 fig.

Descriptors: *Lightning arrestors, *Lightning, *Electrical grounding, Electrical equipment, Pumps, Water wells.
Identifiers: *Lightning damage, *Water well pump protection, Overhead powerlines, Voltage surges.

The destructive action of most lightning discharges can be prevented by the use of properly installed arrestors, grounding and lightning rods. Lightning rods and other grounding mechanisms are made of copper or other metals with good conduction properties certain configurations and arrangements of grounding mechanisms can insure protection of the areas they cover. Protection of water well pump motors from lightning discharge and power surges induced by lightning may be implemented by the use of lightning arrestors. In general, the application of lightning arrestors consist of: (1) selection of the voltage rating, (2) choosing the specific type of arrestor required, and (3) determination of arrestor placement to insure adequate yet economical protection. (Heiss-NWWA)
W76-11917

IMPRESSION TOOL EVALUATES PERFORATION EFFECTIVENESS,
Standard Oil Co. of California, Western Operations, Inc., Oildale.
G. W. Anderson.
World Oil, Vol. 182, No. 6, p 57-62, May, 1976. 8 fig, 4 tab, 6 ref.

Descriptors: *Drilling equipment, *Well casings, Boreholes, Wells, Permeability, Test procedures, California.
Identifiers: *Inflatable packers, *Downhole perforations, *Perforation impression tool, *Jet perforations, Well stimulation, Permeability correlations.

A new inflatable packer system has been developed by Standard Oil Company of California, for producing accurate impressions of downhole perforations, milled slots and other features on the inside surface of casings or liners. Special materials allow long lasting impressions to be made quickly with low differential pressures. The recovered tool gives an immediate visual picture of the wellbore condition. Quantitative evaluations can be made by measuring the packer surface extrusions and applying special calibrations to obtain true dimensions of downhole features. In the case of jet perforations it can be determined if individual perforations are connected to the permeable formation. Field data taken with the inflatable impression packer indicates that, without further stimulation, less than 50 percent of new jet perforations are effective in low-pressure, unconsolidated California oil sands. (Heiss-NWWA)
W76-11918

HELICOPTER RIG CAN DRILL TO 20,000 FEET.
World Oil, Vol. 182, No. 6, p 89-90, May, 1976. 2 fig.

Descriptors: *Drilling equipment, *Oil wells.
Identifiers: *Helicopter transportable drilling rig, *Module concept, Improved drilling economy.

The Ideco Model MSH-2000, a new helicopter transportable rig rated for drilling to 20,000 feet, is the largest of its kind ever constructed. Designed for rapid assembly and disassembly using 4,000-pound modules; the rig was built for Pertamina, the Indonesian state oil company and will be delivered to Balikpapan, Borneo, Indonesia. Two important objectives included in the design to improve over-all drilling economy are: (1) minimized man hours required for assembly/disassembly and readying the equipment for airlift (2) reducing the total number of lifts by using highly engineered module concepts throughout the design. The drawworks are rated for 2,000 horse power nominal and has four speeds forward and two reverse speeds to the drum. Two forward and two reverse speeds through engine mounted transmission - converter units, and two forward speeds from a Hi-Lo friction clutch transmission, also are provided. Cat works and rotary drive are independent units. Driller controls installed on the floor control all drilling and hoisting functions. Rig power is provided by six engines. The sand line unit is complete with a Caterpillar engine and twin disc converters. The block is a shorty unitized traveling model with a tripler hook rated at 360 tons with five 42-inch sheaves. The swivel with a 300-ton rating is complete with washpipe packing, lower sub and gooseneck hose assembly. The mast is rated at 710,000 pounds hookload capacity using 10 lines. Substructure capacity is 650,000 pounds on the rotary table and 340,000 pounds in the pipe set-back area. (Heiss-NWWA)
W76-11920

HOW TO BUILD A FLOATING SCRAP TIRE BREAKWATER,
Rhode Island Univ., Narragansett. Dept. of Ocean Engineering and Marine Advisory Service.
T. Kowalski, and N. Ross.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-251 142, $3.50 in paper copy, $3.00 in microfiche. Rhode Island University Marine Bulletin No. 21, 1975. 15 p, 8 fig, 5 ref. 04-3-158-3.

Descriptors: *Continental Shelf, *Breakwaters, *Construction, *Coasts, *Coastal engineering, *Shore protection, *Offshore platforms, Costs, Protection, Waste disposal.
Identifiers: *Outer Continental Shelf, *Floating scrap tires, *Coastal protection, Scrap tires.

Scrap tires can be used by marinas to construct breakwaters at the cost per linear foot ranging from $4 to $30. Tests performed on a prototype showed that it could reduce by 75% the wave heights of 3- to 4-foot waves, and by up to 100% the height of 1/2-foot waves. Besides low costs, these breakwaters present other advantages. They can be used where surface-to-bottom breakwaters are not feasible, they are movable, and they utilize a resource which is readily available at very low cost. (Sinha-OEIS)
W76-11944

9. MANPOWER, GRANTS AND FACILITIES

9A. Education (Extramural)

THE CHALLENGE OF WATER RESOURCES EDUCATION,
Proceedings, UCOWR Annual Meeting, July 27-30, 1975, Auburn University, Alabama. Universities Council on Water Resources, Nebraska University, Lincoln. 154 p, 2 append.

Descriptors: *Water resources, *Education, *Civil engineering, Economics, Planning, Water quality Engineering, Training, Universities, Environmental engineering.
Identifiers: Curriculum, Teaching methods, Faculty, Universities Council on Water Resources.

The 1975 Annual Meeting of the Universities Council on Water Resources was devoted to identifying water resources education and research related to static or decreased levels of university enrollment and funding. Workshops were conducted to explore problems related to: (1) teaching and learning methods, (2) curriculum and course content, (3) faculty mobility, (4) nation

ds, (5) educational institutional arrangements, (6) limited financial resources. The ceedings included papers presented at the kshops, a list of the participants in the meet- and resolutions passed by the delegates. ers presented at two panel discussions, dels of Water Resources Education' and ctions to Workshop Reports,' were also in- ed. (Robinson-ISWS)
-11863

SCIENTIFIC AND TECHNICAL INFORMATION

BIOLOGICAL AND ECOLOGICAL EFTS OF OIL POLLUTION IN TROPICAL ERS. AN ANNOTATED BIBLIOGRAPHY,
sonian Institution, Washington, D. C. Office ernational and Environmental Programs.
rimary bibliographic entry see Field 5C.
11936

. Secondary Publication nd Distribution

ONIC OIL CONTAMINATION AND TIC ORGANISMS WITH EMPHASIS ON CRA: STATUS AND BIBLIOGRAPHY,
ont Univ., Burlington. Dept. of Entomology.
imary bibliographic entry see Field 5C.
1709

C PARTICIPATION IN WATER URCES DEVELOPMENT, A BIBLIOG- Y.
of Water Research and Technology, gton, D.C.
nary bibliographic entry see Field 6B.
903

AL ZONE POLLUTION BY OIL AND CONTAMINANTS: GUIDELINES FOR , ASSESSMENT AND MONITORING IN CAL REGIONS. BASED UPON A CASE IN INDONESIA, IN 1973,
nian Institution, Washington, D. C.
nary bibliographic entry see Field 5B.
935

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LTURAL ENGINEERING WATER RCES INFORMATION RETRIEVAL OF HED LITERATURE,
tate Water Survey, Urbana.
mphreys, and W. D. Lembke.
o. 76-2090 presented at Annual meeting n Society of Agricultural Engineers, Univ., Lincoln, June 27-30, 1976. 8 p, 3 T W-203(No. 6250)(1). 14-34-0001-6250.

rs: *Information retrieval, *Information , *Agricultural engineering, *Water , Water pollution sources, Nitrates, ater, Water quality, Publications, Data s, Abstracts, Documentation.

rs, practicing engineers, and administraricultural engineering have an interest in ect of the water resources field. They rmation to assist them in meeting the ds of agriculture and to solve water reblems. A national water resources data een established by the Water Resources Information Center (WRSIC), Office of search and Technology, U.S. Departterior. At present the data base contains 93,000 abstracts of published literature on water resources, and the base is growing at a rate of about 13,000 per year. WRSIC publishes abstracts in 'Selected Water Resources Abstracts.' Each semi-monthly issue contains approximately 550 abstracts. In addition, the abstracts are stored in a computer data bank for machine retrieval. Assembling input information for the data base and retrieving information were discussed. Results of a computer search showed a large amount of information related to the nitrate groundwater problem is available to the agricultural engineer. Judicious use of computer searches should substantially reduce the time normally required in a library for retrieving specific literature applicable to an agricultural engineer's water related problem. (Humphreys-ISWS)
W76-11691

[redacted]

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As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

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FOREWORD

elected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent nographs, journal articles, reports, and other publication nats. The contents of these documents cover the water-ted aspects of the life, physical, and social sciences as l as related engineering and legal aspects of the charac-stics, conservation, control, use, or management of water. h abstract includes a full bibliographical citation and a set escriptors or identifiers which are listed in the **Water ources Thesaurus.** Each abstract entry is classified into ields and 60 groups similar to the water resources re-rch categories established by the Committee on Water ources Research of the Federal Council for Science and hnology.

SIC IS NOT PRESENTLY IN A POSITION TO PROVIDE PIES OF DOCUMENTS ABSTRACTED IN THIS JOUR-. Sufficient bibliographic information is given to enable lers to order the desired documents from local libraries ther sources.

cted Water Resources Abstracts is designed to serve scientific and technical information needs of scientists, neers, and managers as one of several planned services e Water Resources Scientific Information Center SIC). The Center was established by the Secretary of the ior and has been designated by the Federal Council for nce and Technology to serve the water resources com-ity by improving the communication of water-related arch results. The Center is pursuing this objective by co-ating and supplementing the existing scientific and tech-information activities associated with active research investigation program in water resources.

rovide WRSIC with input, selected organizations with e water resources research programs are supported as ters of competence" responsible for selecting, abstract-ing, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on the inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the Bio-Science Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
U.S. Department of the Interior
Washington, DC 20240

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01 NATURE OF WATER
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02 WATER CYCLE
Includes the following Groups: General; Precipitation; Snow, Ice, and Frost; Evaporation and Transpiration; Streamflow and Runoff; Groundwater; Water in Soils; Lakes; Water in Plants; Erosion and Sedimentation; Chemical Processes; Estuaries.

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07 RESOURCES DATA
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ABSTRACT SOURCES

LIBRARY U. OF I. URBANA-CHAMPAIGN

SELECTED WATER RESOURCES ABSTRACTS

NATURE OF WATER

A. Properties

ATER -- UNUSUAL RAW MATERIAL AT IE SERVICE OF THE PAPER INDUSTRY 'EAU -- MATIERE PREMIERE ANORMALE SERVICE DU PAPETIER),
r primary bibliographic entry see Field 3E.
76-12484

WATER CYCLE

A. General

RIVATION OF TIME OF CONCENTRA-ON,
w Mexico Inst. of Mining and Technology, corro.
primary bibliographic entry see Field 2E.
6-12196

ME ASPECTS OF STOCHASTIC RESER-IR THEORY,
nash Univ., Clayton (Australia).
primary bibliographic entry see Field 4A.
5-12197

TER BALANCE IN UGANDA,
kerere Univ., Kampala (Uganda). Dept. of graphy.
jo.
asional Paper No. 53, 1974. 70 p, 6 fig, 18 s, 2 tab, 50 ref.

criptors: *Africa, *Water balance, *Climates, ian Ocean, *Evapotranspiration, Hydrologic e, Energy, Soil moisture, Transpiration, poration pans, Seasonal, Rainfall, Lysimeters, ation, Rain gages.
tifiers: *Uganda, East Africa, *Outflow com-nts, Potential evapotranspiration, Soil sture storage, Hours of sunshine.

valuation of the water balance of Uganda was e to include not only rainfall and temperature lso evapotranspiration. Reference was made st studies, such as Thornthwaite and Penman, explanations were given on the basic defini- of the concept of the water balance as well as ariations in the components and the factors cting them. The distributions of annual values otential evapotranspiration as well as the es for January, March, June, and September discussed. The annual and monthly values of vater balance as well as tables of the water ice for some stations in the country were . It was recognized that although monthly r balanced computation had been done, com-ion for daily or weekly periods would have more practical for applying irrigation. erts - ISWS)
12204

FALL GENERATION: A NONSTATIONA-TIME-VARYING MULTIDIMENSIONAL EL,
o Rico Univ., Mayaguez. Dept. of Civil En-ring.
rimary bibliographic entry see Field 2B.
12208

ONAL SIMULATION OF STREAMFLOW A,
Carolina State Univ., Raleigh. Dept. of gical and Agricultural Engineering.
Wiser.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 496, $7.75 in paper copy, $3.00 in microfiche. North Carolina Water Resources Research Institute, Raleigh, UNC-WRRI Rpt. No. 116, July 1976. 196 p, 19 fig, 4 tab, 11 ref, 7 append. OWRT B-064-NC(2). 14-31-0001-4112.

Descriptors: *Streamflow forecasting, *Streamflow, *Watersheds(Basins), Digital computers, Rainfall, Reservoir sites, Lakes, Evapotranspiration, Rainfall-runoff relationships, *North Carolina, Model studies, Computer models, Simulation analysis, Regional analysis.
Identifiers: *Flow estimates, *Streamflow Synthesis and Reservoir Regulation(SSARR), *Hydrologic Information Storage and Retrieval System(HISARS), Sub-basins, Neuse River(NC), Yadkin River(NC).

A system has been developed for simulation of streamflow data at any point in a region. The system is known as NCSSARR (North Carolina version of the Streamflow Synthesis and Reservoir Regulation model). NCSSARR is based on the Streamflow Synthesis and Reservoir Regulation (SSARR) model developed at the North Pacific Division of the Corps of Engineers in Portland, Oregon. Control programming minimizes input requirements to permit a planner with limited hydrologic or computer background to use the system. The system is interfaced with the data storage and retrieval system known as HISARS to provide convenient data access as well as routine processing of the simulated streamflow. NCSSARR permits a broad range of capabilities, ranging from fairly simple simulation requiring minimal input to very sophisticated simulation utilizing the full capabilities of SSARR but requiring extensive input. Streamflow can be simulated for small relatively homogeneous watersheds or for large streams combining flow from a number of different areas. This report provides a general description of the system. Other chapters deal with hydrologic and computer procedures to implement the system, and describe a series of tests, comparing simulated flows with observed records. Documentation of the programs is provided in Appendices. (Stewart-North Carolina State)
W76-12250

ON HYDROBIOLOGY: CRITICAL MISAPPREHENSIONS CONCERNING THE DISCIPLINE, (IN HUNGARIAN),
Lajos Kossuth. Univ., Debrecen (Hungary). Zoological Inst.
G. Devai.
Acta Biol Debrecina. 10/11, p 101-116, 1972.

Descriptors: *Hydrobiology, Hydrologic aspects, Biology, Oceanography, Hydrology.
Identifiers: Biotope, *Cryobiology, Disciplines, *Limnobiology, *Potamobiology, *Stigobiology.

According to the International Association for Scientific Hydrology, this science consists of the branches: potamology, limnology, cryology and stigology. A definition of the science of hydrobiology and a statement of purpose are given. This science consists of 5 fields of study; oceanobiology, limnobiology, potamobiology, stigobiology and cryobiology. Basically, all are concerned with 'water quality', which is defined as the degree of complementary interaction between the animate and inanimate components of a biotope. A correct evaluation of the interrelationships of these components is integral to an accurate prediction of the future state of a body of water.--Copyright 1975, Biological Abstracts, Inc.
W76-12269

ESTIMATING GROUNDWATER EVAPOTRANSPIRATION FROM STREAMFLOW RECORDS,
Geological Survey, Doraville, Ga.
For primary bibliographic entry see Field 2D.
W76-12285

PHOSPHORUS LOSS BY STREAM TRANSPORT FROM A RURAL WATERSHED: QUANTITIES, PROCESSES, AND SOURCES,
Pennsylvania Univ., Philadelphia.
For primary bibliographic entry see Field 5B.
W76-12435

DISSOLVED NUTRIENT LOSSES IN STORM RUNOFF FROM FIVE SOUTHERN PINE WATERSHEDS,
Agricultural Research Service, Oxford, Miss. Sedimentation Lab.
For primary bibliographic entry see Field 5B.
W76-12436

PLOT-DERIVED PARAMETERS FOR BASIN COMPUTATIONS,
Agricultural Research Service, Beltsville, Md. Hydrograph Lab.
G. H. Comer, and H. N. Holtan.
Hydrological Sciences Bulletin, Vol. 21, No. 1, p 53-59, March 1976. 3 fig, 2 tab, 7 ref.

Descriptors: *Basins, *Model studies, *Digital computers, *Runoff, Watersheds(Basins), Hydrologic systems, Soil analysis, Crops, Hydrology, Data collections.
Identifiers: Plot-derived parameters, *Basin computations, Plots, Digital basin model, Cropping patterns, Hydrological records, Watershed hydrology, Climatological data.

Data from small plots within a basin were used with a digital basin model to estimate parameters for computing runoff from the entire basin. The Hydrograph Laboratory of the United States Department of Agriculture developed and tested a mathematical model which treated a basin as a distributed system to operate on homogeneous hydrological response units of the basin. The parameters inferred from soils and crop data were optimized using the digital model to compute runoff from the plots. The optimized values of soil and crop parameters were then used to compute the runoff from the total basin. The data requirements for the model included the climatological data, basin descriptors, and soil parameters. Climatological data included precipitation, air temperature, and evaporation rate. Basin data required land use data, soil data, and crop data. The results demonstrated the value of plot data and the importance of a deterministic model which used parameters derived from readily available soil and crop data. (Roberts-ISWS)
W76-12438

WATER YIELD MODEL USING SCS CURVE NUMBERS,
Agricultural Research Service, Temple, Tex.
J. R. Williams, and W. V. LaSeur.
Journal of the Hydraulics Division, Vol 102, No HY9, p 1241-1253, September 1976. 6 tab, 6 ref.

Descriptors: *Agricultural watersheds, *Reservoir design, *Runoff, *Soil moisture, *Water yield, Soil conservation, Mathematical models, Equations, Simulation analysis, Optimization, Computers, Rainfall, Systems analysis.

A model was developed to predict daily runoff from agricultural watersheds with areas up to 2,590 km2. The model is based on the SCS runoff curve number procedure and a soil moisture index. It was designed to have general applicability, computational efficiency, simple inputs, and good prediction accuracy. The model has one parameter, uses a 1-day time interval, and only outputs runoff volume. Inputs are an estimate of the II-condition SCS runoff curve number, measured monthly runoff, daily rainfall, and average monthly lake evaporation. The model is calibrated on a gaged

watershed and can be used to extend short periods of record for the calibrated watershed or to predict water yield for nearby ungaged watersheds. In tests with data from 47 watersheds in Texas, the model simulated runoff fairly accurately. Applications include reservoir design, water quality modeling, and flood control evaluation. (Bell-Cornell)
W76-12522

2B. Precipitation

RADAR DERIVED SPATIAL STATISTICS OF SUMMER RAIN - EXPERIMENT DESCRIPTION,
Johns Hopkins Univ., Laurel, Md. Applied Physics Lab.
For primary bibliographic entry see Field 7B.
W76-12178

RADAR DERIVED SPATIAL STATISTICS OF SUMMER RAIN - DATA REDUCTION AND ANALYSIS,
Johns Hopkins Univ., Laurel, Md. Applied Physics Lab.
For primary bibliographic entry see Field 7B.
W76-12179

RADAR DERIVED SPATIAL STATISTICS OF SUMMER RAIN - APPENDICES.
Johns Hopkins Univ., Laurel, Md. Applied Physics Lab.
For primary bibliographic entry see Field 7B.
W76-12180

STUDY OF THE LOWER STRATOSPHERIC THERMAL STRUCTURE AND TOTAL OZONE FROM NIMBUS-4 IRIS,
National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center.
C. Prabhakara, and E. B. Rodgers.
NASA Technical Note D-8134, January 1976. 35 p, 25 fig, 19 ref, 1 append.

Descriptors: *Ozone, *Temperature, *Remote sensing, Satellites(Artificial), Infrared radiation, *Atmosphere, Maps, Mapping, Monthly, Measurement, Circulation, Meteorology, Equations.
Identifiers: *Nimbus-4, *Stratosphere, Lower stratosphere, Global distribution.

The global distribution of temperature in the stratosphere from 100 to 10 mbar and the total ozone in the atmosphere were remotely sensed from the Nimbus-4 IRIS measurements for a period of about one year. The temperature and ozone data were presented in the form of monthly mean global maps. The standard deviations of temperature and ozone with respect to zonal averages were calculated. The mean and the variable state of the stratosphere were discussed with the help of these observations. The lower stratosphere in the tropical regions revealed a significant wave number one pattern in the circulation. The Arctic and Antarctic stratospheric winter circulation regimes displayed a different behavior apparently due to the ocean and orographic differences. (Sims-ISWS)
W76-12184

ATMOSPHERIC STRUCTURE AND VARIABILITY IN AREAS OF CONVECTIVE STORMS DETERMINED FROM 3-H RAWINSONDE DATA,
Texas A and M Univ., College Station. Center for Applied Geosciences.
G. S. Wilson, and J. R. Scoggins.
Contractor Report NASA CR-2678, April 1976. 118 p, 65 fig, 1 tab, 32 ref, 1 append. NASA NAS8-26751.

Descriptors: *Storms, *Cloud physics, *Convection, Thunderstorms, Weather, Equations, Variability, Distribution patterns, Rainfall, Rainfall disposition, Forecasting, Measurement, Stability, Moisture, Radar, Data processing, Meteorology, *Atmosphere, Atmospheric physics.
Identifiers: *Rawinsonde data.

The structure and variability of the atmosphere in areas of radar-observed convection are established by using the unique 3-h rawinsonde and surface data from NASA's second Atmospheric Variability Experiment (AVE II) conducted on May 11 and 12, 1974. Convective activity was shown to exist in areas where the low and middle troposphere is moist and the air is potentially and convectively unstable and has upward motion, in combination with positive moisture advection, at either the surface or within the boundary layer. The large variability of the parameters associated with convective storms over time intervals less than 12 h was also demonstrated so as to possibly produce a change in the probability of convective activity by a factor of 8 or more in 3 h. Between 30 and 60% of the total changes in parameters associated with convective activity over a 12-h period was shown to take place during a 3-h period. These large changes in parameters, normally measured with 12-h data, were related to subsynoptic-scale systems that many times produced convective storms. (Sims - ISWS)
W76-12185

WATER BALANCE IN UGANDA,
Makerere Univ., Kampala (Uganda). Dept. of Geography.
For primary bibliographic entry see Field 2A.
W76-12204

RAINFALL GENERATION: A NONSTATIONARY TIME-VARYING MULTIDIMENSIONAL MODEL,
Puerto Rico Univ., Mayaguez. Dept. of Civil Engineering.
R. L. Bras, and I. Rodriguez-Iturbe.
Water Resources Research, Vol. 12, No. 3, p 450-456, June 1976. 3 fig, 2 tab, 24 ref. NWS Contract 4-36738.

Descriptors: *Rainfall, *Model studies, *Storms, Algorithms, Statistics, Water resources, Precipitation(Atmospheric), Rainfall intensity, Areal, Hyetographs, Equations.
Identifiers: *Rainfall generation, *Rainfall synthesis, Multidimensional model, Rainfall models, Exterior rainfall characteristics, Interior rainfall characteristics, Nonstationary multidimensional rainfall generator, Point rainfall.

Most existing rainfall models do not concentrate on storm exterior characteristics. Very few models attempt to generate exterior and interior rainfall characteristics everywhere in space, and those that do have limiting assumptions of stationary behavior at all levels of storm activity. Therefore, a nonstationary, multidimensional model was suggested. The suggested model, capable of simulating historical storm exteriors and interiors, assumed the validity of G. I. Taylor's hypothesis turbulence within the storm interior. First-order statistics of storm interiors as well as the correlation in time and space of the storm interiors were preserved. The model had the advantages of being based on concepts easy to understand, being multi-dimensional, and being computationally easy to implement. The research described would be applicable for any kind of rational description of the rainfall process. (Roberts - ISWS)
W76-12208

FINE-SCALE TIME VARIATIONS OF RAINFALL IN WESTERN OREGON,
Oregon State Univ., Corvallis. School of Oceanography.
C. L. Trump, and W. P. Elliott.
Water Resources Research, Vol. 12, No. 3, p 556-560, June 1976. 3 fig, 3 tab, 11 ref.

Descriptors: *Rainfall, *Oregon, *Illinois, *Pacific Ocean, Winter, Linear programming, Statistics, Storms, Mathematical studies, Precipitation(Atmospheric), Time series analysis, On-site investigations, Variability, Seasonal, On-site data collections.
Identifiers: *Rain rates, Western Oregon rainfall, Fine-scale time variations, Winter rainy season, Nondimensional variability statistics, Illinois rainfall, Summer convective rainfall, Linear function.

One-minute rain rates were measured at three sta tions on a line running inland from the coast acros a low mountain range during a winter rainy season The average of three nondimensional variabilit statistics were significantly greater on the coas than inland. Rain rate distributions showed that greater portion of the rain fell at higher rates o the coast, and autocorrelation analysis showe that the rainfall was less persistent on the coas than inland. Oregon results were compared wit similar results concerning Illinois summer convec tive rainfall. Even though the Illinois rainfall wa distinctly more intense and less persistent than th Oregon rainfall, the relative variabilities were su prisingly similar. The logarithm of the total rai falling at rates greater than a given rate was foun to be a linear function of that rate. It was foun that the concentrations of large airborne sea-sa particles, the cloud-forming nuclei, peaked at th coastline and dropped off rapidly inland. (Robert - ISWS)
W76-12209

A HIGH SIERRA PRECIPITATION MEASURE MENT PROGRAM, FINAL REPORT ON TH 1975 SEASON,
Atmospherics Inc., Fresno, Calif.
T. J. Henderson, M. Henderson, and M. Morris.
Report, November 15, 1975. 34 p, 2 fig, 3 tab, 5 ap pend.

Descriptors: *Precipitation(Atmospheric *Rainfall, *Mountains, *California, Measuremen Rain gages, Rainfall disposition, Elevation, Ru noff, Water temperature, On-site investigation Meteorology, Climatology.
Identifiers: *Sierra Mountains, Rain gage networ

Historically, reliable rainfall totals at high altitud in remote mountain areas are usually the weak lin within the broad field of hydrologic studies. Th has been particularly true throughout many of th high altitude regions of the Southern Sierra Rang in California where precipitation measuremen during the summer months have been limited to few scattered locations. New investigations streamflow runoff relationships, plus an increa ing emphasis on more efficient water use, hav focused attention on the importance of summe precipitation at elevations above 9,000 ft msl. late 1971, Atmospherics Incorporated and th Kings River Conservation District, Fresn California, began a series of discussions on th feasibility of establishing a temporary high altitud raingage network in the Southern Sierra Range California. This report described the various a tivities associated with the 1975 High Sier Precipitation Measurement Program and sum marized the results obtained during the variou network visitations in the 1972, 1973 and 197 seasons. (Sims - ISWS)
W76-12446

THE AWS HANDBOOK OF GROUND-BASE COLD FOG DISSIPATION USING VENTE LIQUID PROPANE, VOLUME I - THEROY AN PRACTICE.
Air Weather Service, Scott AFB, Ill.
For primary bibliographic entry see Field 3B.
W76-12471

LIBRARY U. OF I. URBANA-CHAMPAIGN

2C. Snow, Ice, and Frost

CENTRAL SIERRA PROFILING SNOW GAGE: A GUIDE TO FABRICATION AND OPERATION,
Forest Service (USDA), Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station.
L. Smith, H. G. Halverson, and R. A. Jones.
Atomic Energy Commission, Oak Ridge, Tenn., Technical Information Center, TID-25986, February 1972. 53 p, 10 fig, 3 tab, 6 ref, 4 append.

Descriptors: *Snowpacks, Snowmelt, Radioisotopes, Snow management, Fabrication, Flood forecasting, Runoff forecasting, Precipitation gages, Instrumentation, *California.
Identifiers: Snowpack density, Snowpack depth.

Studies at the Central Sierra Snow Laboratory in California have produced a remotely operated snow gage with which snowpacks may be profiled. Snowpack density and depth are printed in gm cm- and hundredths of feet from ground line to snow- interface. Water content can be computed from the data. Detailed instructions are given for manufacture, calibration, operation, and data reduction. (Forest Service)
W76-12158

DEVELOPMENT OF A RADIOACTIVE ISOTOPE PROFILING SNOW GAGE,
Forest Service (USDA), Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station.
L. Smith, H. G. Halverson, and R. A. Jones.
Atomic Energy Commission, Oak Ridge, Tenn., Technical Information Center, February 1972, 72. 86 p, 28 fig, 50 ref, 2 append.

Descriptors: Radioisotopes, *California, Streamflow forecasting, Snow management, Snowmelt, Calibration, *Instrumentation, *Snowpacks, Precipitation gages.
Identifiers: Snowpack density, Snowpack depth.

Since 1909, when the technique of snow surveying to determine water content of the snowpack was developed, many gravimetric methods have been designed and used. At the U. S. Forest Service's Central Sierra Snow Laboratory in California, seven generations of profiling snow gages using radioactive isotopes have been developed and used. The final product is a twin-probe gage with which a snowpack of any depth can be profiled. With density in gm cm-3 for each one-half inch and depth of each location in hundredths of feet are printed on a paper tape. Calibration equations have been solved. The gage can be used for streamflow forecasting from snowmelt and for studies in snow hydrology. (Forest Service)
W76-12159

SEASONAL SNOW SURFACE ENERGY BALANCE IN A FOREST OPENING,
Forest Service (USDA), Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station.
G. Halverson.
Atomic Energy Commission, Oak Ridge, Tenn., Technical Information Center, TID 26242, August 2. 73 p, 11 fig, 3 tab, 62 ref, append.

Descriptors: Snow management, *Snowmelt, Snowpacks, Radioisotopes, Land management, Energy budget, *Seasonal, *Precipitation gages, Measurement, *California.
Identifiers: Snowpack density.

Calculation of seasonal energy balance is a promising method of predicting the snowpack water balance. In-situ snow density measurements are obtained in an open area 400 feet in diameter of the profiling snow gage. The water balance is estimated with snow gage data. Measurements of humidity gradients, windspeed, temperature, and net radiation were also obtained at 30-minute intervals for use in calculating the components of the energy balance for the snowpack surface. During the 1967-68 season, the water balance estimate indicated that 31.59 inches of water fell as snow and melted or evaporated between January 1 and April 26. The corresponding energy balance estimates of snow ablation totaled 32.18 inches for the same period. From December 10, 1968 to May 23, 1969, 60.85 inches water equivalent ablated according to the water balance; the energy balance predicted 60.74 inches. Evaporation as calculated by the energy balance averaged only 0.42 inches per month. Sensible heat transfer was negligible during the accumulation season. It became positive during the melt period. Net radiation averaged less than 50 cal cm-2 day-1 during the accumulation season, but during the melt period it averaged over 100 cal cm-2 day-1. Latent heat flux was usually small (less than 30 cal-2cm-1day-1) and gradually declined to zero during the late spring snowmelt season. Melt and refreezing were important forms of daily energy storage and release. (Forest Service)
W76-12160

MEASUREMENT OF SNOWPACK WETNESS,
Forest Service (USDA), Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station.
W. I. Linlor, J. L. Smith, M. F. Meier, F. C. Clapp, and D. Angelakos.
In: Proceedings 43rd Annual Meeting Western Snow Conference, Coronado, California, Measurement of Snowpack Wetness, April 1975. p 14-20. 6 fig, 2 tab. Paper 590-75.

Descriptors: Snow management, *Snowpacks, Streamflow forecasting, *Precipitation gages, Moisture content, Measurement, Methodology, Snowmelt, Instrumentation, Capacitors, Microwaves.
Identifiers: Dielectric loss, *Electrical methods(Measurement), *Snow wetness.

Three electrical methods for measuring wetness of snow are: (1) Change in capacitance of a sample before and after freezing. (2) Dielectric loss (or quality factor) of a sample in a high-frequency field. (3) Attenuation of a microwave beam in transmission through snow. Of the three electrical methods, two require sampling, but the microwave system can be operated entirely automatically in remote installations, utilizing satellite telemetry for data gathering. (Forest Service)
W76-12162

SNOW WETNESS MEASUREMENTS FOR MELT FORECASTING,
National Aeronautics and Space Administration, Moffett Field, Calif. Ames Research Center.
W. I. Linlor, F. D. Clapp, and M. F. Meier.
In: Procedings Workshop on Operational Applications of Satellite Snowcover Observations, South Lake Tahoe, Calif., August 1975, National Aeronautics and Space Administration, p 375-397, 1975. 6 fig, 3 tab, 32 ref.

Descriptors: *Runoff forecasting, *Snowmelt, *Snowpacks, Snow management, Telemetry, *Precipitation gages, *Moisture content, Water supply, Flood forecasting, Water equivalent, *Microwaves, Measurement, Instrumentation.
Identifiers: *Snow wetness.

A microwave technique for directly measuring snow pack wetness in remote installations is described. The technique, which uses satellite telemetry for data gathering, is based on the attenuation of a microwave beam in transmission through snow. (Forest Service)
W76-12165

REMOTE SENSING OR SNOWPACK DENSITY USING SHORTWAVE RADIATION,
National Environmental Satellite Service, Washington, D.C.
M. C. McMillan, and J. L. Smith.
In: Proceedings Workshop on Operational Applications of Satellite Snowcover Observations, South Lake Tahoe, California, August 1975, National Aeronautics and Space Administration, p 361-374, 1975. 6 tab, 26 ref.

Descriptors: *Snowpacks, *Snowmelt, Snow management, *Albedo, Measurement, Runoff forecasting, Flood prediction, *Precipitation gages, *Radiation, *Remote sensing.
Identifiers: *Snowpack density.

Albedo or satellite radiance measurements can be used to estimate average snowpack density by means of a multiple linear equation. The in situ data equation predicted density with a correlation (r2) of 0.79 and a standard error of 0.027 gm cm-3. The data from LANDSAT-1 were not as significant in a similar equation, possibly because of the large field of view. (Forest Service)
W76-12167

O18/O16 ABUNDANCE VARIATIONS IN SIERRA NEVADA SEASONAL SNOWPACKS AND THEIR USE IN HYDROLOGICAL RESEARCH,
Calgary Univ. (Alberta). Dept. of Physics.
H. R. Krouse, and J. L. Smith.
In. Proceedings International Hydrolic Decade Snow and Ice, Banff, Canda, September 1972, p 24-38, 1973. 6 fig, 11 ref.

Descriptors: *Snowpacks, Snow management, Snowmelt, *Tracers, *California, Water supply, Ice, *Radioisotopes, *Oxygen isotopes, Isotope studies.
Identifiers: *Sierra Nevada(Calif).

In addition to other parameters, O18/O16 abundances were determined for new fallen snow and snowpacks at 1900 m elevation in the central Sierra Nevadas of California during storms in the winters of 1965-68. The O18 values ranged from -5 to -26 0/00 SMOW (Standard Mean Ocean Water). Isotopic minima that have been identified with the coldest winter precipitations in other studies were not discernible. Isotopic compositions were not determined solely by temperature but depended upon other factors such as wind direction. The isotopic composition of individual layers changed markedly as melt water moved through the pack. These changes were related to hydrologic processes such as ice granule formation and water absorption by individual snow layers. No relation was found between snow density and isotope composition. It is concluded that when ice layers are formed under topographic and atmospheric conditions typical of this area, the identification of seasonal trends in glaciers is extremely difficult and subject to misinterpretation. (Forest Service)
W76-12169

WATER YIELD IMPROVEMENT RESEARCH OF THE PACIFIC SOUTHWEST FOREST AND RANGE EXPERIMENT STATION AND ITS USEFULNESS TO WILDLAND RESOURCE MANAGEMENT,
Forest Service (USDA), Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 4C.
W76-12170

THE CHEMISTRY OF 700 YEARS OF PRECIPITATION AT DYE 3, GREENLAND,
Army Cold Regions Research and Engineering Lab., Hanover, N. H.
For primary bibliographic entry see Field 5A.
W76-12181

ICE THICKNESS OBSERVATIONS, NORTH AMERICAN ARCTIC AND SUBARCTIC, 1970-71, 1971-72,
Cold Regions Research and Engineering Laboratory, Hanover, N. H.
M. A. Bilello, and R. E. Bates.

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Available from the National Technical Information Service, Springfield, VA 22161 as AD-A010 329, $5.50 in paper copy, $3.00 in microfiche. Special Report 43, Pt. VII, April 1975. 103 p, 7 fig, 6 tab, 8 ref.

Descriptors: *Ice, *Arctic, *Subarctic, *Alaska, *Canada, Cold regions, Ice cover, Lake ice, Rivers, Sea ice, Winter, Measurement, Surveys, Data collections.
Identifiers: *Ice thickness.

This seventh in a series of reports on lake and river ice and land-fast sea ice presented ice thickness measurements observed throughout the North American Arctic and subarctic during the 1970-71 and 1971-72 winter seasons. Information on surface ice conditions, dates of first ice, freeze-over and breakup, and detailed measurements of ice thickness across Alaskan rivers were also included. Some reports from the Alaska National Guard network on ice thickness measurements in remote areas of western Alaska were also presented. Analyses were made of maximum observed ice thicknesses reported during the two winters, and deviations from the mean ice thickness measured across rivers and creeks in southeast Alaska between 1965 and 1972. A tabulation of the dates when maximum ice was observed at 25 locations in Alaska, 44 in Canada, and 1 in Greenland during each year from 1961 to 1972 was also given. Computations of the average annual date of maximum ice at all the stations and an isoline map showing the results for northern North America was presented. (Sims - ISWS)
W76-12182

THERMAL ANALYSIS OF FROZEN EMBANKMENT ISLANDS,
Puget Sound Naval Shipyard, Bremerton, Wash.
For primary bibliographic entry see Field 2L.
W76-12200

SHADOW LENGTH TABLES FOR ENVIRONMENTAL PLANNING,
Forest Service (USDA), Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 4A.
W76-12240

CONTROLLING SOLAR LIGHT AND HEAT IN A FOREST BY MANAGING SHADOW SOURCES,
Forest Service (USDA), Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 4A.
W76-12241

SHADOW LENGTH TABLES FOR LATITUDE 42 DEGREES NORTH,
Forest Service (USDA), Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 4A.
W76-12242

SHADOW LENGTH TABLES FOR LATITUDE 50 DEGREES NORTH,
Forest Service (USDA), Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 4A.
W76-12243

SHADOW LENGTH TABLES FOR LATITUDE 44 DEGREES NORTH,
Forest Service (USDA), Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 4A.
W76-12244

SHADOW LENGTH TABLES FOR LATITUDE 46 DEGREES NORTH,
Forest Service (USDA), Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 4A.
W76-12245

SHADOW LENGTH TABLES FOR LATITUDE 48 DEGREES NORTH,
Forest Service (USDA), Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 4A.
W76-12246

SHADOW LENGTH TABLES FOR LATITUDE 38 DEGREES NORTH,
Forest Service (USDA), Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 4A.
W76-12247

SHADOW LENGTH TABLES FOR LATITUDE 40 DEGREES NORTH,
Forest Service (USDA), Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 4A.
W76-12248

SHADOW LENGTH TABLES FOR LATITUDE 36 DEGREES NORTH,
Forest Service (USDA), Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 4A.
W76-12249

FIELD DETERMINATION OF THE DENSITIES OF LAKE ICE SHEETS,
Trent Univ., Peterborough (Ontario). Dept. of Geography.
W. P. Adams.
Limnology and Oceanography, Vol. 21, No. 4, p 602-608, July 1976. 3 fig, 2 tab, 12 ref.

Descriptors: *Ice, *Lake ice, *Density, *Canada, *Lakes, Surveys, On-site investigations, Snow cover, Ice cover, Buoyancy, Measurement, Equations, Winter.
Identifiers: *Ice density, *Gillies Lake(Ontario), *Knob Lake(Ontario).

A method of calculating the mean density for a lake ice sheet and estimating the mean density of the white ice component of such a sheet made use of the buoyancy equation for floating ice. The equation related the density of the ice to the mean density and thickness of water and snow, and the thickness of the ice. The technique required the measurement of snow density on the lake. Mean ice sheet densities of 0.89 and 0.85 g/cu cm and mean white ice densities of 0.84-0.87 were reported from two lakes. (Sims - ISWS)
W76-12429

A SNOWMELT RUNOFF MODEL AND ITS APPLICATION TO SHORT-RANGE FORECASTING OF FLOOD DISCHARGES,
Hydrometeorological Service of the USSR, Moscow.
A. P. Zhidikov, A. G. Levin, N. S. Nechaeva, and E. G. Popov.
Hydrological Sciences Bulletin, Vol. 21, No. 1, p 195-202, March 1976. 2 fig, 8 ref.

Descriptors: *Snowmelt, *Runoff, *Model studies, *Forecasting, Mathematical models, Floods, Equations, Rivers, Flow, Precipitation(Atmospheric), Snowfall, Snow cover, Watersheds(Basins), Discharge(Water), Hydrographs, Spring, Seasonal, Reservoirs, Water resources.
Identifiers: *USSR, *Volga River(USSR), Short-range forecasting, Spring flood.

A snowmelt runoff model was derived for relatively small rivers. The model involved the main components of the catchment water budget: physiographical and some other factors: water equivalent of snow cover, precipitation, antecedent moisture content, daily snowmelt, non uniformity of snow cover, retention capacity of the basin, and percentage of forest area. The model structure included calculations of the daily values of snowmelt excess and the transformation of these values into discharges at the outlet of the basin based on meteorological observations and appropriate distribution functions. Both calculations were made separately for open and forest areas. The parameters of the model were derived by optimization methods. The linear model based on the superposition principle was used to transform the discharges of a small river into total inflow into a large reservoir. The combined model was used to forecast for five days in advance daily mean inflows into the Gorky and Kuibyshev reservoirs (on the River Volga), using the observed and forecast discharges of the small rivers as input. (Sims-ISWS)
W76-12440

OXYGEN ISOTOPE STUDIES ON SEA ICE IN THE GULF OF ST. LAWRENCE,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia). Atlantic Oceanographic Lab.
F. C. Tan, and W. D. Fraser.
Journal of the Fisheries Research Board of Canada, Vol. 33, No. 6, p 1397-1401, June 1976. 1 fig, 1 tab, 9 ref.

Descriptors: *Oxygen isotopes, *St. Lawrence Seaway, *Isotope studies, *Oxygen, *Radioisotopes, *Isotope fractionation, Analytical techniques, Water properties, *Sea ice, Sea water, Gulfs, Analysis, Chemistry, Radiochemical analysis, Oceans, Instrumentation, Salinity, Distillation.
Identifiers: *Oxygen isotope studies, *Gulf of St. Lawrence, *Isotopic enrichment, St. Lawrence estuary, Ice core studies, Enriched ice, Enriched snow, Ice cores, Slush ice, Surface seawater, Analytical procedures.

The fractionation of oxygen isotopes between sea ice and sea water in samples collected from the Gulf of St. Lawrence indicated that sea ice is enriched in its 018:016 ratio with respect to coexisting sea water. It was observed that sources of sea ice in the Gulf of St. Lawrence may be identified on the basis of 018:016 measurements. (Henley - ISWS)
W76-12448

FROST, MOISTURE, AND EROSION.
Transportation Research Board, Washington, D. C.
For primary bibliographic entry see Field 2G.
W76-12451

PAVEMENT CRACKING IN WEST TEXAS DUE TO FREEZE-THAW CYCLING,
Texas A and M Univ., College Station. Dept. of Civil Engineering.
S. H. Carpenter, R. L. Lytton, and J. A. Epps.
In: Frost, Moisture, and Erosion; Transportation Research Record 532, Transportation Research Board, National Research Council, Washington, D. C., p 1-13, 1975. 12 fig, 1 tab, 22 ref.

Descriptors: *Highways, *Freezing, *Thawing, *Texas, Roads, Road construction, Paving, Highway icing, Salts, Laboratory tests, Finite element analysis, Temperature, Moisture content, Civil engineering, Freeze-thaw tests.
Identifiers: West Texas, *Pavement cracking, Freeze-thaw cycling, Pavements, Soil suction, Biaxial freezing.

Freeze-thaw contraction of the base course material used in west Texas is considered an important element in pavement deterioration. Sam

les from two compactive efforts were frozen in a iaxial closed system. Suction and temperature ithin the samples were monitored and volume ianges after each freeze-thaw period were corded. Coefficients of thermal activity were lculated from the dimension measurements. hese coefficients showed a relationship with the -compacted total soil moisture suction, which as similar for all materials. Finite element studies the thermal strains that develop in a typical ivement showed that the thermally induced ten- e stresses in the base course are far in excess of pical tensile strengths for initially intact pave- ents. The surface course did not develop exces- ve stress levels. Freeze-thaw cycling produced astic deformations in all samples, and the per- anent expansion or contraction was related to e as-compacted total soil moisture suction. ese permanent deformations from freeze-thaw cling imparted a residual tensile stress to the phalt concrete. During a freeze, the suction in e sample showed a marked increase, often 10 to times the initial value. The suction then dropped low the initial value during the thaw cycle. This op was consistent regardless of the thermal ac- ity or plastic deformation. This indicated a reor- nization of the moisture in the sample, which y be related to strength losses caused by freeze- w cycling. The data in this study gave new in- ht into the mechanism of freeze-thaw in pave- nt deterioration. (See also W76-12451) (Sims - WS)
76-12452

GINEERING PROPERTIES OF COM- CTED CLAY CONDITIONED BY SATURA- ON AND FREEZE-THAW CYCLES,
obil Research and Development Corp., Dallas, x.
A. Pagen, and V. K. Khosla.
Frost, Moisture, and Erosion; Transportation search Record 532, Transportation Research ard, National Research Council, Washington, C., p 14-29, 1975. 14 fig, 2 tab, 18 ref.

scriptors: *Highways, *Compacted soils, turated soils, *Freezing, Thawing, Saturation, ys, Soils, Roads, Road construction, Paving, oratory tests, Strength of materials, Tempera- e, Moisture content, Subsurface drainage, Civil ineering.
ntifiers: *Freeze-thaw cycling, Pavements, grade drainage.

s research quantitatively evaluated the effect saturation and freeze-thaw cycles on the logical characteristics of a compacted sub- le. Kaolin samples compacted by 25, 40, and 80 vs of a drop hammer were tested over a wide ge of moisture contents and densities. The ire and rheological parameters investigated relate to soil strength are unconfined com- sive strength, modulus of elasticity, creep dulus, and complex elastic modulus. Laborato- ompacted samples were saturated under con- ed boundary stress conditions in a specially gned chamber and were then subjected to nine ze-thaw cycles before testing. Results showed volumetric swelling, although less than the me of absorbed water, increases as compac- energy increases and that soil structure also ges under saturation and freeze-thaw cycles. logical parameter values seemed to be inde- lent of the compaction energy levels used. ults also showed that compacted cohesive sub- es exposed to saturation and freeze-thaw cy- in the field will experience major reductions in -carrying capacity. Therefore, it is recom- ded that the design of rigid and flexible pave- s over cohesive subgrades for areas in which c freezing and thawing occurs should focus er attention on providing adequate subgrade age so that initial saturation of the subgrade is nized. (See also W76-12451) (Sims - ISWS)
-12453

CASE STUDIES OF VARIATIONS IN SUB- GRADE MOISTURE AND TEMPERATURE UNDER ROAD PAVEMENTS IN VIRGINIA,
Virginia Highway and Transportation Research Council, Charlottesville.
N. K. Vaswani.
In: Frost, Moisture, and Erosion; Transportation Research Record 532, Transportation Research Board, National Research Council, Washington, D. C., p 30-42, 1975. 13 fig, 1 tab.

Descriptors: *Roads, *Moisture content, *Temperature, *Subsoil, *Virginia, Precipitation(Atmospheric), Highways, Road construction, Soils, Underground, Soil moisture, Strength of materials, Freezing, Subsurface drainage, Paving, Civil engineering.
Identifiers: Subgrades, Subgrade drainage, Pavements.

Changes in moisture under uncovered ground and in the subgrades of pavements were evaluated. The pavements ranged from new to about 10 years old. Moisture content was determined by a nuclear probe to determine moisture depth. The findings were as follows: (1) the higher the compaction and dry density of the subgrade soil were, the lower the moisture content would be; (2) subgrade moisture content increased sharply from the beginning to the end of construction; (3) for 1 or 2 years from the date of the subgrade construction, moisture content increased because of precipitation and after this time the rate of increase in moisture decreased; and (4) after about 10 years there was little increase in the subgrade moisture content. (See also W76-12451) (Sims - ISWS)
W76-12454

SATELLITE SNOW OBSERVATIONS AND SEASONAL STREAMFLOW FORECASTS,
National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center.
A. Rango, and V. V. Salomonson.
Final Report, January 1976, 19 p, 7 fig, 3 tab, 5 ref. NOAA Contract No. NA-776-74.

Descriptors: *Satellites(Artificial), Meteorology, *Remote sensing, Snow, *Snow cover, *Snowmelt, Streamflow, *Streamflow forecasting, Asia, Wyoming.
Identifiers: Satellite observations, Environmental satellite observations, Earth resources satellite observations, *Snow observations, *Indus River Basin(India), *Wind River Mountains(Wyo).

Relatively low spatial resolution (about 4 km) environmental satellite and high spatial resolution (80m) earth resources satellite data have been used to map snow-covered areas in the upper Indus River Basin in Pakistan and the Wind River Mountains in Wyoming. For the Indus River, early Spring snowcovered area measurements were obtained and compared to April through June total streamflow during the years 1967-1971. A linear regression equation quantitatively expressing the relationship had an r2 = 0.91. Prediction of the April-June 1972 streamflow using this equation produced an estimate that was within three percent of the actual total. Composited results from two years of data over seven Wind River Mountain watersheds indicated that Landsat-1 snowcover observations, separated on the basis of watershed mean elevation, were also related to seasonal runoff as expressed in the form of statistically significant regression equations. These results indicate that satellite-derived snowcovered area has the potential for becoming a useful input parameter for improved prediction of snowmelt runoff. (NOAA)
W76-12468

SOME REMARKS ON THE UNUSUAL BEAU- FORT SEA ICE CONDITIONS IN SUMMER 1975,
Alaska Univ., College. Geophysical Inst.
G. Wendler, and K. O. L. F. Jayaweera.
SG Report No. 76-7, Geophysical Inst. No. UAG R-246, May 1976. 28 p, 14 fig, 1 tab, 29 ref. SG No. 04-6-158-44039.

Descriptors: Weather, *Weather data, Ice, *Ice cover, *Sea ice, *Alaska, Arctic, Arctic Ocean, Sea water.
Identifiers: *Sea ice movement, *Ice thickness, Prudhoe Bay(Alas), *Beaufort Sea(Alas).

In the summer of 1975 the sea ice conditions between Point Barrow and Prudhoe Bay were the severest since 1898 when the ice did not move away from shore at all. In 1975 the movement started later than in any year since that time and was incomplete. From the meteorological point of view this event is very interesting and also had great economic ramifications because the need to resupply the Prudhoe Bay oil fields by barges could not be carried out as planned. These unusual ice conditions were caused by: (a) a thicker than normal ice cover for the winter of 1974-75 owing to a cold and snow-deficient winter; (b) a cooler than normal summer 1975 which not only slowed down the rate of ice decay but also shortened the period in which melting occurred, and (c) the unusual wind conditions in summer 1975 which were caused by a persistent low pressure system over the high Canadian Arctic for July, August, and September, adding a northwesterly wind component to the average wind which kept the ice near to shore. The last reason is believed to be the most important. (NOAA)
W76-12470

WINDBREAKS MAY INCREASE WATER YIELD FROM THE GRASSLAND ISLANDS IN ARIZONA'S MIXED CONIFER FORESTS,
Forest Service (USDA), Tempe, Ariz. Forest Hydrology Lab.; and Forest Service (USDA), Tempe, Ariz. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 3B.
W76-12477

2D. Evaporation and Transpiration

SEASONAL SNOW SURFACE ENERGY BALANCE IN A FOREST OPENING,
Forest Service (USDA), Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 2C.
W76-12160

WATER BALANCE IN UGANDA,
Makerere Univ., Kampala (Uganda). Dept. of Geography.
For primary bibliographic entry see Field 2A.
W76-12204

FOREST SOILS AND THE ASSOCIATED SOIL-PLANT WATER REGIME,
Forest Service (USDA), Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 2G.
W76-12239

ESTIMATING GROUNDWATER EVAPOTRANSPIRATION FROM STREAM-FLOW RECORDS,
Geological Survey, Doraville, Ga.
J. F. Daniel.
Water Resources Research, Vol 12, No 3, p 360-364, June 1976. 5 fig, 10 ref.

Descriptors: *Evapotranspiration, *Groundwater, *Estimating, *Model studies, *Streamflow, Flow rates, Aquifer characteristics, Transmissivity, Surface-groundwater relationships, Hydrologic data, *Alabama.
Identifiers: *Indian Creek(Ala).

An analytical solution for the evapotranspiration rate from the aquifer system of a stream basin was applied to a selected basin despite large-scale violations of assumptions for the derivation. Rates computed represent losses from the groundwater bodies and do not include losses from soil moisture. The computed rate for the 23.00 sq km basin, Indian Creek near Troy, Alabama, during April and May 1963 was 0.037 cu m/sec, or about 0.5 cm/month. Such results should be reliable enough to use in rainfall-runoff models and, in the absence of more detailed data, in areal groundwater models. (Woodard-USGS)
W76-12285

2E. Streamflow and Runoff

FLOOD DAMAGE REDUCTION POTENTIAL OF RIVER FORECAST SERVICES IN THE CONNECTICUT RIVER BASIN,
National Weather Service, Silver Spring, Md. Office of Hydrology.
For primary bibliographic entry see Field 4A.
W76-12186

A METHOD OF FINDING THE FAMILY OF RUNHYDROGRAPHS FOR GIVEN RETURN PERIODS,
Natal Univ., Durban (South Africa). Dept. of Civil Engineering.
L. A. V. Hiemstra, W. S. Zucchini, and G. G. S. Pegram.
Journal of Hydrology, Vol. 30, No. 1/2, p 95-103, May 1976. 6 fig, 5 ref.

Descriptors: *Hydrographs, *Hydrograph analysis, *Peak discharge, *Flood frequency, *Flow rates, Frequency analysis, Runoff, Hydrology, Design flood.
Identifiers: *Runhydrographs, *Vaal River(South Africa), *South Africa, Lognormal probability distribution, Return period, Exceedance probability, Run-theory.

Most observed flood hydrographs at a problem point are composite hydrographs. Expotential function describe both the rising and recession limbs of averaged composite hydrographs very well. These averaged composite hydrographs are called run-hydrographs because run-theory was used in the averaging process. A log transformation results in triangular shapes for runhydrographs. Runhydrographs are therefore fully defined in terms of times-to-peak and peak rates of runoff measured on and from a selected horizontal truncation level, respectively. A bivariate lognormal probability distribution for times-to-peak and peak rates of runoff is a satisfactory descriptor for the occurrence of runhydrographs. Parameters were estimated from 50 years of continuous instantaneous hydrograph record for the Vaal River at Standerton. Contours of equal probability of exceedance were calculated from the bivariate lognormal probability distribution which enables the extraction of a family of runhydrographs for any desired probability of exceedance. This capability enables the civil engineer to select the members of this family of most interest to his flood problem. (Lardner - ISWS)
W76-12195

DERIVATION OF TIME OF CONCENTRATION,
New Mexico Inst. of Mining and Technology, Socorro.
V. P. Singh.
Journal of Hydrology, Vol. 30, No. 1/2, p 147-165, May 1976. 4 fig, 8 ref.

Descriptors: *Time of concentration, *Runoff, *Precipitation intensity, *Watersheds(Basins), Continuity equation, Momentum equation, Equilibrium, Hydrology, Equations, Mathematical studies, Rainfall, Time.
Identifiers: *Space-time distribution, *Kinematic wave equation, Watershed characteristics, Method of characteristics, Plane sections, Converging sections.

Generalized expressions for the time of concentration are derived from the kinematic wave theory. Two types of geometric configurations are considered in the derivations: (1) rectangular plane section and (2) converging section. It was shown that under very special conditions the well-known Kirpich's formula for the time of concentration is a special case of the generalized expressions. Furthermore, it was shown that the rainfall duration has definite influence on the time of concentration - a fact that apparently has not been considered before. (Lardner - ISWS)
W76-12196

DISCHARGE PREDICTION, PRESENT AND FORMER, FROM CHANNEL DIMENSIONS,
Wisconsin Univ., Madison. Dept. of Geography.
G. H. Dury.
Journal of Hydrology, Vol. 30, No. 3, p 219-245, July 1976. 6 fig, 3 tab, 37 ref.

Descriptors: *Discharge(Water), *Channel flow, *Channels, Streams, Valleys, Velocity, Humid areas, Slopes, Beds, Meanders, Equations.
Identifiers: *Discharge prediction, *Channel dimensions, Underfit streams, Valley meanders, Empirical study, Power-functions, Slope factor, Bedwidth, Meander wavelength.

Discharge at the most probable annual flood can be predicted from the dimensions (including slope) of existing stream channels. The predicting technique was modified for application to former channels, all of which were considered unbraided. The analysis of formerly available data plus new data on bedwidth, meander wavelength, channel slope and discharge, in some cases, provided empirical confirmation of the theoretical relationships of channel to discharge, and in other cases produced results fully consonant with those relationships. Analysis confirmed a linear relationship, that extended through flume observations, between meander wavelength and discharge. Analysis also permitted the identification of stereotype numerical constants for use in the equations relating width, depth, velocity, slope, roughness and wavelength to the discharge of streams in humid regions. Allowance for cross-sectional area and channel slope resulted in a predicting equation that, tested against channels which discharge 395 cu m/s or less at the most probable annual flood, was highly successful in predicting for channels that carried 11,500 and 283,170 cu m/s at the same frequency. (Roberts - ISWS)
W76-12198

INCREASING THE MEAN CURRENT IN COASTAL CHANNELS,
Rosenstiel School of Marine and Atmospheric Science, Miami, Fla.
For primary bibliographic entry see Field 2L.
W76-12201

SURFACE WATER AVAILABILITY, PICKENS COUNTY, ALABAMA,
Geological Survey, Tuscaloosa, Ala.
For primary bibliographic entry see Field 4A.
W76-12280

FLOOD DISCHARGE OF STREAMS IN NEW MEXICO AS RELATED TO CHANNEL GEOMETRY,
Geological Survey, Albuquerque, N. Mex.
A. G. Scott, and J. L. Kunkler.
Open-file report 76-414 June 1976. 29 p, 6 fig, 3 tab, 18 ref.

Descriptors: *Flood discharge, *Streams, *New Mexico, *Flood recurrence interval, *Flood forecasting, Flow rates, Gaging stations, Channel morphology, Hydrologic data, Evaluation.
Identifiers: Log-Pearson Type III

Results are described of a study relating flood characteristics to the reference width of the channel. Data from 79 gaging stations were used in these analyses. Stations were selected which would provide estimates of floods of a 10-year recurrence interval and at which channel-geometry could be adequately measured in the field. The discharges for recurrence intervals of 2, 5, 10, 25 and 50 years were determined for each station by the log-Pearson Type III method. The relation between the magnitude of floods of various frequencies and the reference width and main-channel slope was reliable with a standard error of about 65 percent for most of the areas of the State. (Woodard-USGS)
W76-12294

A SNOWMELT RUNOFF MODEL AND ITS APPLICATION TO SHORT-RANGE FORECASTING OF FLOOD DISCHARGES,
Hydrometeorological Service of the USSR, Moscow.
For primary bibliographic entry see Field 2C.
W76-12440

REMOTE SENSING OF MISSISSIPPI RIVER CHARACTERISTICS,
Colorado State Univ., Fort Collins, Dept. of Civil Engineering.
For primary bibliographic entry see Field 7B.
W76-12442

2F. Groundwater

ON THE GENERAL EQUATIONS FOR FLOW IN POROUS MEDIA AND THEIR REDUCTION TO DARCY'S LAW,
Princeton Univ., N. J. Dept. of Civil Engineering.
W. G. Gray, and K. O'Neill.
Water Resources Research, Vol. 12, No. 2, p 148-154, April 1976. 1 fig, 15 ref, append. NSF ENG75-16072 and NSF-RANN 6064.

Descriptors: *Groundwater, Equations, *Darcy's law, Mathematics, *Flow, Subsurface waters, Groundwater movement, Groundwater potential, Pore water, Energy equation, Momentum equation, Mathematical studies, *Porous media, Mass transfer, Convection, Dispersion.
Identifiers: *Equations of flow, *Newtonian fluid, General equations, *Isotropic media, Inertia.

A technique of local averaging was applied to obtain general equations which describe mass and momentum transport in porous media. The averaging was performed without significantly idealizing either the porous medium or the pertinent fluid mechanical relations. The resulting general flow equation was simplified to treat flow of a Newtonian fluid in a slowly deforming solid matrix for two special cases. For flow in an isotropic medium where convective and inertial terms are important, an equation was developed which is dependent only on five medium parameters which could be evaluated by experiment. Flow in an anisotropic medium was also analyzed, and the general equation was reduced to Darcy's law when the convective and inertial terms were neglected. (Prickett - ISWS)
W76-12199

HYDRODYNAMICS OF GROUNDWATER FLOW IN A FRACTURED FORMATION,
Birmingham Univ. (England). Dept. of Civil Engineering.
T. D. Streltsova.
Water Resources Research, Vol. 12, No. 3, p 405-414, June 1976. 9 fig, 3 tab, 31 ref, 1 append.

LIBRARY U. OF I. URBANA-CHAMPAIGN

Descriptors: *Groundwater movement, Hydrodynamics, *Equations, Fractures(Geologic), Hydraulic properties, Aquifers, Aquitards, Elasticity(Mechanical), Homogeneity, Heterogeneity, Drawdown, Testing, Pumping, Porous media, Fissures(Geologic), Graphical analysis, Mathematical studies, Rock properties.
Identifiers: *Fissure flow, *Pore flow, Recovery, Type curves.

Hydrodynamical aspects of groundwater flow in fractured formations and the basic hydraulic properties controlling the flow were considered. A brief literature survey on studying the physical characteristic of the fractured rocks and on developing an understanding on the mechanism of fluid flow in fracture formations constituted an introductory section. Basic definitions, relations, and assumptions given for subsequent interpretation of the flow behavior in a fissured rock then followed. Concepts of fractured, homogeneous, and heterogeneous water-bearing formations and their response mechanism to a pressure change were considered. The general differential equations for a flow in a fractured and in a heterogeneous formation of uniform anisotropy were derived. Two types of the flow behavior, fissure flow and pore flow, were distinguished. Two drawdown equations, respectively, for a flow in a fissure space, whether void or infilled with a fine material, and for a flow in a porous space to a well discharging at a constant rate in a fractured aquifer, were given. A fractured reservoir response to a pressure change due to pumping was illustrated by the field drawdown and recovery data. A particular case of a heterogeneous formation, an aquifer-aquitard system, was discussed, and the drawdown distribution in both aquifer and aquitard was given when account is taken of their elastic properties. (Visocky - ISWS)
W76-12207

DIGITAL MODEL TO PREDICT EFFECTS OF PUMPING FROM THE ARIKAREE AQUIFER IN THE DWYER AREA, SOUTHEASTERN WYOMING,
Geological Survey, Cheyenne, Wyo.
For primary bibliographic entry see Field 4B.
W76-12277

THE SHALLOW AQUIFER--A PRIME FRESHWATER RESOURCE IN EASTERN PALM BEACH COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
G. Rodis, and L. F. Land.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-254 , $3.50 in paper copy, $3.00 in microfiche. Water-Resources Investigations 76-21, February 6. 12 p, 6 fig, 4 ref.

Descriptors: *Groundwater resources, *Aquifer characteristics, *Water yield, *Water quality, Hydrologic data, Groundwater movement, Water levels, Saline water intrusion.
Identifiers: Eastern Palm Beach County(Fla).

The shallow aquifer underlies all of Palm Beach County, Fla., and is the source of almost all freshwater supplies in the eastern part of the county. It consists of mixtures of sand, shell sandstone, and limestone. In this area the concentration of dissolved solids in the ground water usually does not exceed 500 milligrams per liter. A section of cavidolled limestone and other permeable rocks is exposed several miles inland and extends north to almost the entire length of the county. This section yields up to 2,000 gallons per minute of water to large wells and offers an excellent potential for the development of future ground water supplies. Sea-water intrusion into the shallow aquifer is a potential threat to several coastal well fields. The wells nearest the coast are most vulnerable. (Woodard-USGS)
W76-12278

AVAILABILITY OF GROUND WATER NEAR CARMEL, HAMILTON AND MARION COUNTIES, INDIANA,
Geological Survey, Indianapolis, Ind.
For primary bibliographic entry see Field 6A.
W76-12287

GROUND-WATER RESOURCES IN THE LOMPOC AREA SANTA BARBARA COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
G. A. Miller.
Open-file report 76-138, April 1976. 78 p, 25 fig, 12 tab, 61 ref.

Descriptors: *Groundwater resources, *Aquifer characteristics, *Water yield, *Groundwater recharge, *Water quality, Water utilization, Hydrologic data, Data collections, Pumping, Water wells, Irrigation, Surface-groundwater relationships, Hydrogeology, Water level fluctuations, Chemical analysis, *California.
Identifiers: Lompoc area(Calif), Santa Barbara County.

Water supplies in the Lompoc plain in Santa Barbara County, Calif., are pumped from highly permeable gravel and sand, which make up the main water-bearing zone. The history of groundwater quality in the Lompoc area shows little change in the Lompoc upland and the Lompoc terrace, but an increase in the concentration of dissolved solids in the main water-bearing zone beneath the Lompoc plain. Most water pumped from this zone is used for irrigation and contains dissolved solids in concentrations ranging from less than 500 to more than 3,000 milligrams per liter (mg/liter). The average concentration is about 1,500 mg/liter. The total hardness is more than 1,000 mg/liter, and most of this water contains more than 750 mg/liter sulfate; the most abundant ions are calcium, sodium, sulfate, and bicarbonate. Changes in ground-water quality seem largely related to irrigation return; to inflow of native water of poor quality; to discharge of sewage effluent; and, in the shallow water-bearing zone, perhaps to the oxidation of sulfide minerals. Average annual recharge to ground water in the plain from the Santa Ynez River, local tributaries, underflow, and infiltration of rain is about 14,000 acre-ft. Discharge of ground water from the Lompoc plain is by pumping, evapotranspiration, streamflow, and underflow to the ocean. Pumpage during 1972 was about 23,000 acre-ft, less than half of which probably returned to the main water-bearing zone. (Woodard-USGS)
W76-12288

A NOTE ON COMPUTING FINITE DIFFERENCE INTERBLOCK TRANSMISSIVITIES,
Geological Survey, Reston, Va.
C. A. Appel.
Water Resources Research, Vol 12, No 3, p 561-563, June 1976. 2 fig, 5 ref.

Descriptors: *Transmissivity, *Aquifers, *Equations, *Hydrogeology, *Aquifer characteristics, Flow rates, Steady flow, Methodology.
Identifiers: *Interblock transmissivities.

An expression is presented for the interblock transmissivity that gives the exact flow rate at steady state for the case where the aquifer transmissivity is a linear function between block centers. This formulation would be preferred for cases where the areal variation in transmissivity is gradual rather than abrupt. (Woodard-USGS)
W76-12292

DEVELOPING A STATE WATER PLAN: GROUND-WATER CONDITIONS IN UTAH, SPRING OF 1976,
Geological Survey, Salt Lake City, Utah.
For primary bibliographic entry see Field 4B.
W76-12296

WATER-LEVEL CHANGES IN SOUTHWESTERN KANSAS, 1940-75,
Geological Survey, Lawrence, Kans.
For primary bibliographic entry see Field 4B.
W76-12297

GROUND-WATER RESOURCES OF LANE AND SCOTT COUNTIES, WESTERN KANSAS,
Geological Survey, Lawrence, Kans.
For primary bibliographic entry see Field 4B.
W76-12298

A SLUG TEST FOR DETERMINING HYDRAULIC CONDUCTIVITY OF UNCONFINED AQUIFERS WITH COMPLETELY OR PARTIALLY PENETRATING WELLS,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
H. Bouwer, and R. C. Rice.
Water Resources Research, Vol. 12, No. 3, p 423-428, June 1976. 4 fig, 11 ref.

Descriptors: *Hydraulic conductivity, *Aquifer testing, *Aquifers, *Water wells, *Thiems equation, Water levels, Resistance networks, Analog models, Equations, Transmissivity, Water table aquifers, Water table, Potentiometric level, Permeability, Equilibrium.
Identifiers: *Slug test, Effective radius, Partial penetration, Equipotentials.

A procedure was presented for calculating the hydraulic conductivity of an aquifer near a well from the rate of rise of the water level in the well after a certain volume of water is suddenly removed. The calculation was based on the Thiem equation of steady state flow to a well. The effective radius R sub e over which the head difference between the equilibrium water table in the aquifer and the water level in the well is dissipated was evaluated with a resistance network analog for a wide range of system geometries. An empirical equation relating R sub e to the geometry of the well and aquifer was derived. It was discovered that the technique is applicable to completely or partially penetrating wells in unconfined aquifers; it can also be used for confined aquifers that receive water from the upper confining layer. The method's results were compatible with those obtained by other techniques for overlapping geometries. (Visocky - ISWS)
W76-12432

UNSTEADY FLOW TO A NONPENETRATING ARTESIAN WELL,
Singapore Univ. Dept. of Civil Engineering.
M. H. A. Khader, and D. Ramadurgaiah.
Ground Water, Vol. 14, No. 4, p 200-204, July-August 1976. 5 fig, 2 tab, 9 ref.

Descriptors: *Groundwater, *Artesian aquifers, *Water wells, *Drawdown, *Penetration, Equations, Mathematical studies, Unsteady flow, Steady flow, Aquifer testing, Groundwater movement, Wells.
Identifiers: *Nonpenetrating artesian wells, *Leaky artesian conditions, Type curves, Finite well diameter, *Laplace transformations, Response curves.

Exact solution to the problem of unsteady drawdown in a leaky artesian aquifer due to a constant discharge nonpenetrating well was presented. Finiteness of the well radius and aquifer anisotropy were considered in formulating the problem. The solution was derived on the assumption that the flux entering the pumped well was uniformly distributed over the plane circular bottom of the well. The aquifer was considered to be finite in thickness, but of infinite lateral extent. The flow of groundwater was assumed to be governed by Jacob's model of linear leakage. The Laplace transformation technique was employed in the theoretical development. The drawdown function was numerically integrated in terms of

dimensionless parameters of the flow system and the results were depicted in graphs. (Prickett-ISWS)
W76-12445

ANALYTIC SOLUTIONS FOR DETERMINING NATURALLY FRACTURED RESERVOIR PROPERTIES BY WELL TESTING,
Instituto Mexicano del Petroleo, Mexico City.
For primary bibliographic entry see Field 8B.
W76-12449

INTERPRETATION OF IN SITU PERMEABILITY TESTS ON ANISOTROPIC DEPOSITS,
Birmingham Univ. (England).
For primary bibliographic entry see Field 2G.
W76-12455

INVESTIGATION OF FILTRATION CHARACTERISTICS OF A NONWOVEN FABRIC FILTER,
Marks-Rosen, Inc., Knoxville, Tenn.
For primary bibliographic entry see Field 2G.
W76-12459

MULTIVARIATE ANALYSIS OF GEORGIA COASTAL PLAIN GROUNDWATERS,
Georgia Inst. of Tech., Atlanta. School of Geophysical Sciences.
C. O. Pollard, S. A. Mulaik, and W. S. Parks, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 839, $5.00 in paper copy, $3.00 in microfiche. Georgia Environmental Resources Center, Atlanta, Report No. ERC-0676, July 1976, 88 p, 16 ref, 16 append. OWRT A-063-GA(1). 14-31-0001-5010.

Descriptors: *Groundwater, *Georgia, Coastal plains, Water quality, Water chemistry, Acquifer characteristics, Geochemistry, Chemical analysis, Water analysis, Water wells, Silica, Hydrogen ion concentration, Fluorides, Brines, Limestone.
Identifiers: *Multivariate analysis, Cluster analysis, Factor analysis, Evaporites.

Chemical analyses of groundwaters from 589 Georgia Coastal Plain wells were cluster-analyzed (both hierarchically and non-hierarchically) using the major elements, depth, and locations as the 14 variables that had been measured on each well. Hierarchical clustering produced the most meaningful classification of these groundwaters, in that most of the 17 clusters obtained were restricted geographically and the geologic ages of the producing horizons were also somewhat restricted to known continuous aquifers. Discriminant analysis of the clustered data yielded discriminant functions for the classification of future wells and a ranking of the variables in terms of importance for distinguishing among clusters, SiO_2, pH, and F were the three most important chemical variables in this respect, and Cl and Na were the least important. Factor analysis of the clustered data revealed source variables (brine, limestone, evaporites, etc.) that account for observed correlated variations in the chemical analyses. Most of the waters appear to have equilibrated with their surroundings to the extent that they now identify their surroundings. The brine-contaminated waters found in the coastal area were identified and were split into levels of contamination. Timely and useful information about critical interactions within Georgia groundwaters was gained from available somewhat incomplete, data without the delays and expenses required for traditional hydrologic and geologic studies. The study has defined characteristics of waters in the clusters and the natural factors that affect those characteristics, both of which can be used as background for comparison of future environmental impacts and for predictions of effects of proposed groundwater recharge and coolant wells.
W76-12466

2G. Water In Soils

PEAT TEMPERATURE REGIME OF A MINNESOTA BOG AND THE EFFECT OF CANOPY REMOVAL,
Forest Service (USDA), Grand Rapids, Minn. North Central Forest Experiment Station.
J. M. Brown.
Journal of Applied Ecology, Vol. 13, p. 189-194, April 1976. 1 fig, 2 tab, 8 ref.

Descriptors: *Peat, *Bogs, Organic soils, *Soil temperature, *Water temperature, *Minnesota, *Climatology, Clear-cutting, Canopy, Streamflow, Water table.
Identifiers: Black spruce trees, Forested strips, *Peat temperature.

Temperatures, at four depths, were routinely measured in a strip-cut black spruce bog to determine the peat temperature regime and the effect of canopy removal. Peat temperatures were unaffected by removal of the canopy. Peat temperatures near the surface were closely correlated to climatic conditions while temperatures at a depth of 2 meters lagged several months behind the climatic regime. Outlet stream temperatures showed that streamflow originates primarily from the upper surface of the bog water table. (Forest Service)
W76-12174

EFFECT OF SEEPAGE ON EMBANKMENT DEFORMATIONS DUE TO WATER LOADING,
Sydney Univ. (Australia). School of Civil Engineering.
For primary bibliographic entry see Field 4A.
W76-12188

FOREST SOILS AND THE ASSOCIATED SOIL-PLANT WATER REGIME,
Forest Service (USDA), Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station.
J. L. Smith.
In: Isotopes and radiation of soil-plant relationships, including forestry, International Atomic Energy Agency, Vienna, Austria, p 399-412, 1972. 4 tab, 19 ref. Paper IAAE-SM-151/37.

Descriptors: Radioisotopes, *Soil water movement, Soil-water-plant relationships, *Tracers, *Pinus contorta, Transpiration, *Red fir trees, *Lodgepole pine trees, *Water budget, *Forest soils, Soil moisture, California.

In forest lands, maximum stream discharges, peak flows, soil erosion, plant growth and water yield improvement through vegetation change depend on the hydrologic regime of the soil. The use of radioactive isotopes has made it easier to trace water movement in soils and trees. The technique was used to measure water movement in soils on the Sierra Nevada of California and in two major tree species--red fir (Abies magnifica A. Murr.) and lodgepole pine (Pinus contorta Dougl.) - growing there. Water flow through a pyroclastic soil having porosities of 44 to 61% was traced by tritium and 32P. Water movement in these tree species in early spring when the soil was covered to a depth of 360 cm of snow ranged from 1.5 to 2m/h. Evapotranspiration could not be determined by measuring soil moisture because snowmelt quickly replenished soil moisture. Total water use by lodgepole pine was estimated by combining rates and area of water movement within tree stems. Estimates of water use ranged from 0.1 litre/h for long-term movement in winter to 30.6 litre/h for short-term movement in early spring during ideal transpiration conditions. The results suggest that coefficients for water balance formula based on the energy balance approach can be estimated by using data on water movement determined by isotope tracers. (Forest Service)
W76-12239

FUNDAMENTAL STUDIES ON RESIDUE AND MOVEMENT OF FORESTRY HERBICIDES IN SOIL, (IN JAPANESE),
Utsunomiya Univ. (Japan). Coll. of Agriculture.
For primary bibliographic entry see Field 5B
W76-12263

ANIMAL WASTE AND NITRATE MOVEMENT THROUGH SOIL,
Connecticut Univ., Storrs. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W76-12362

FUNDAMENTALS OF PROGRAMMED SOIL MOISTURE DEPLETION,
Nebraska Univ., Mitchell. Scotts Bluff Experiment Station.
For primary bibliographic entry see Field 3F.
W76-12373

ANALYTICAL SOLUTION OF THE EQUATION FOR TRANSPORT OF REACTIVE SOLUTE THROUGH SOILS,
Florida Univ., Gainesville. Dept. of Soil Science.
H. M. Selim, and R. S. Mansell.
Water Resources Research, Vol. 12, No. 3, p 528-532, June 1976. 3 fig, 18 ref. OWRT A-026-FLA(8

Descriptors: *Soil water movement, *Solute, *Analytical techniques, *Soil chemistry, *Leachate, *Adsorption, Aqueous solution, Soils, Steady flow, Infiltration, Unsteady flow, Laboratory tests, Equations, Mathematical studies, Soil surfaces.
Identifiers: *Solute transport, *Reactive solute, *Soil columns, *Convective-dispersive equation, Pore velocities.

Mathematical solutions of the differential equation governing reactive solute transport in a finite soil column were developed for two specific cases: continuous solute input and pulse-type solute input at the soil surface. These solutions incorporated reversible linear adsorption as well as irreversible solute adsorption. The irreversible adsorption was expressed by a sink/source term which either may be a constant or may have a concentration-dependent form. The boundary condition used across the surface was that of the third type, which accounted for advection as well as dispersion. To illustrate the significance of using the proper boundary conditions, comparisions were made with two other mathematical solutions. It was concluded that the solution presented was highly useful for low pore flow velocities. For large pore velocities, all three solutions were in agreement. (Prickett - ISWS)
W76-12450

FROST, MOISTURE, AND EROSION.
Transportation Research Board, Washington, D. C.
Available from the National Technical Information Service, Springfield VA 22161 as PB-243 44 $4.60 in paper copy, $3.00 in microfiche. Transportation Research Record 532, 1975. 105 p.

Descriptors: *Highways, *Road construction, *Moisture content, *Freezing, *Thawing, Roads, Paving, Temperature, Soils, Subsurface drainage, Soil moisture, Soil properties, Soil mechanics, Permeability, Soil water movement, Moisture meters, Instrumentation, Seepage, Erosion, Filters, Groundwater movement, Measurement, Civil engineering.
Identifiers: *Freeze-thaw cycling, *Pavement, Nonwoven fabric filters, Internal erosion, Dispersive clay soils.

The effects of climate and water on roadway design, construction, and performance have always been of the highest importance. Without temperature changes, structural portions of

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oadway would be rather easy to design for an-
icipated loads as they would be if moisture
hanges were also not present. Therefore, the in-
ormation in this RECORD will be of interest to
oils and design engineers who are concerned with
ie performance of the roadway structure under
ariations of climate, temperature, and moisture.
he combined effects of moisture and temperature
esulting in frost action are generally considered to
e a problem in the northern states, but much
vidence has come to light to indicate that some
outhern states also have their problems. The
roblems may in fact be amplified by the higher
umber of freeze-thaw cycles that are encoun-
red. A study of the problems in west Texas
owed that a reorientation of particles and struc-
re occurs, which brings about residual tensile
ress in the asphalt concrete pavement surface.
nother study showed a sharp rise in subgrade
oisture during construction and immediately
ereafter. The rate of increase decreased and
veled off at about 10 years after construction.
ie particular care that must be taken to prevent
igration of subgrade fines into the permeable
se layer was pointed out. The measurement of
il moisture by remote methods is being aided by
e development of new measuring devices. A
udy of the filtration characteristics of one non-
oven fabric filer was presented. All of the papers
this RECORD make contributions toward a
lution to the problems of roadway soil moisture
d temperature variation. A single solution is not
plicable nationwide nor, in most cases, state-
de, but engineering judgment based on the con-
uing development of the state of knowledge will
oduce the most economic and satisfactory solu-
ns. (See W76-12452 thru W76-12460) (Sims -
WS)
76-12451

**VEMENT CRACKING IN WEST TEXAS DUE
FREEZE-THAW CYCLING,**
xas A and M Univ., College Station. Dept. of
il Engineering.
r primary bibliographic entry see Field 2C.
6-12452

**GINEERING PROPERTIES OF COM-
CTED CLAY CONDITIONED BY SATURA-
ON AND FREEZE-THAW CYCLES,**
bil Research and Development Corp., Dallas,
.
primary bibliographic entry see Field 2C.
6-12453

**SE STUDIES OF VARIATIONS IN SUB-
ADE MOISTURE AND TEMPERATURE
DER ROAD PAVEMENTS IN VIRGINIA,**
ginia Highway and Transportation Research
ncil, Charlottesville.
primary bibliographic entry see Field 2C.
6-12454

**ERPRETATION OF IN SITU PERMEABILI-
TESTS ON ANISOTROPIC DEPOSITS,**
ningham Univ. (England).
. Dunn, and S. S. Razouki.
Frost, Moisture, and Erosion; Transportation
earch Record 532, Transportation Research
rd, National Research Council, Washington,
., p 43-48, 1975. 3 fig, 9 ref.

criptors: *Soils, *Permeability, *Anisotropy,
urface drainage, Percolation, Physical pro-
es, Isotropy, Piezometry, Piezometers, In-
, Laboratory tests, Model studies, Equa-
, Soil physics, Soil properties, Soil moisture,
water movement.
tifiers: Anisotropic permeability.

alculate the permeability of a soil from the
ts of in situ constant- or variable-head tests,
nust know the intake factor for the porous tip
The intake factor for a cylindrical tip of a piezometer is a function of its length and diameter only. No rigorous relationship has yet been derived, but an accurate empirical formula based on the best fit and previously published numerical solutions expresses the intake factor in a dimensionless form as a function of the ratio of the length to diameter of the tip. When tests are carried out in a horizontally bedded cross-anisotropic deposit (e. g., a laminated lacustrine clay), the permeability, calculated by assuming isotropy, will have a value intermediately between the horizontal and vertical permeabilities. If the ratio of these permeabilities is known from laboratory or other tests, a correction factor may be applied to the permeability (assuming isotropy) to determine the coefficients of permeability in the horizontal and vertical directions. The correction factor, which is a function of both the ratio of intake length to intake diameter and the ratio of the coefficient of the permeability in the horizontal position to that in the vertical position, was presented in graphical form to enable quick determination of the directional permeabilities. (See also W76-12451) (Sims - ISWS)
W76-12455

EVALUATION OF PAVEMENT DRAINAGE SYSTEMS MADE OF LAYERS OF OPEN-GRADED BITUMINOUS AGGREGATE MIXTURES,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8F.
W76-12456

CAPACITANCE SENSOR FOR SOIL MOISTURE MEASUREMENT,
State Univ. of New York at Buffalo.
E. T. Selig, D. C. Wobschall, S. Mansukhani, and A. Motiwala.
In: Frost, Moisture, and Erosion; Transportation Research Record 532, Transportation Research Board, National Research Council, Washington, D. c., p 64-76. 1975. 16 fig. 5 ref.

Descriptors: *Soil moisture, *Instrumentation, *Measurement, *Soil moisture meters, Soils, Soil properties, Electrical properties, Electrical conductance, Conductivity, Roads, Road construction, Strength of materials, Moisture meters, Equipment, Soil tests, Soil science, Soil mechanics, Civil engineering.
Identifiers: *Dielectric constant, Capacitance, Subgrade soils.

Moisture content is an important parameter that controls the performance of earth materials. Because satisfactory techniques were not available, this study was undertaken to develop new instrumentation that could be permanently installed in highway substructures for long-term monitoring of moisture content. Moisture content determination requires that the amount of water and the dry weight in a given volume of soil be obtained. This study considered only the amount of water. A concept that involved the relationship between the amount of water in soil and the dielectric constant, an electrical property, was investigated. The electrical capacitance (C) of a pair of electrodes with moist material between them is related to the dielectric constant (K) by C = (ae)K, where a is a constant based on the geometry of the electrodes and e is the permittivity of the vacuum. So that instrumentation problems encountered in the measurement of capacitance and dielectric constant with laboratory methods used in the field could be overcome, the sensor electrodes and soil were incoprorated in the reasonance circuit whose frequency of oscillation is a function of the circuit components. The measured output was the difference between the frequency in soil and in an electronic reference substituted for the soil. The circuit design was first tested with the electrodes forming a container into which soil could be placed. Several configurations of the embedded sensor were designed and tested. The capacitance concept was useful for sensing change in the amount of moisture per unit volume of soil. (See also W76-12451) (Sims-ISWS)
W76-12457

NUCLEAR MAGNETIC RESONANCE SENSORS FOR MOISTURE MEASUREMENT IN ROADWAYS,
Southwest Research Inst., San Antonio, Tex.
G. A. Matzkanin, and C. G. Gardner.
In: Frost, Moisture, and Erosion; Transportation Research Record 532, Transportation Research Board, National Research Council, Washington, D. C., p 77-86, 1975. 13 fig, 1 tab, 4 ref.

Descriptors: *Soil moisture, *Instrumentation, *Soil moisture meters, Measurement, Nuclear moisture meters, Moisture meters, Nuclear magnetic resonance, Soils, Highways, Roads, Road construction, Equipment, Soil tests, Soil properties, Civil engineering, Laboratory tests, Equations.
Identifiers: Subgrade soils, Sensor.

The feasibility of practical instrumentation based on the nuclear magnetic resonance method was investigated to address the need for accurate, reliable moisture measurements in highway systems. A prototype of an implantable sensor that uses the pulsed nuclear magnetic resonance spin-echo technique was developed and subjected to laboratory verification. The sensor was 3 by 2 by 2.25 in (7.6 by 5.1 by 5.7 cm) and weighed about 3 lb (1.35 kg). It directly measured the mass of moisture present; to obtain the percentage of moisture required that soil density be determined by an auxiliary method. Experiments with bentonite, silica flour, and topsoil indicated that the sensor operated reliably, with an accuracy of approximately + or - 1% up to 25% moisture, + or - 2% up to 100% moisture, and + or - 4.5% up to 200% moisture. A dependence of sensor response on soil type necessitated calibration for each soil type. Organic matter and dissolved salt did not affect the sensor readings for bentonite, but organic matter had an effect for silica flour. All of the results obtained were qualitatively accounted for in terms of a simple moisture adsorption and bonding model. (See also W76-12451) (Sims-ISWS)
W76-12458

INVESTIGATION OF FILTRATION CHARACTERISTICS OF A NONWOVEN FABRIC FILTER,
Marks-Rosen, Inc., Knoxville, Tenn.
W. J. Rosen, and B. D. Marks.
In: Frost, Moisture, and Erosion; Transportation Research Record 532, Transportation Research Board, National Research Council, Washington, D. C., p 87-94, 1975. 6 fig, 2 tab, 7 ref.

Descriptors: *Subsurface drainage, *Filtration, *Filters, *Fabrics, Drainage, Roads, Highways, Road construction, Soils, Soil water, Soil aggregates, Seepage, Erosion, Laboratory tests, Permeability, Hydraulics, Subsurface flow, Subsurface waters.
Identifiers: *Nonwoven fabric filters, Mirafi 140.

The purpose of this study was to investigate the behavior of a nonwoven fabric filter in subdrainage applications. Experiments were restricted to a single fabric, Mirafi 140. Conventional aggregate filters were tested under compatible conditions to provide a basis of performance behavior. Experimental results indicated that the nonwoven fabric provides desirable performance under a relatively wide range of soil conditions. Hypotheses that relate to mechanisms controlling the behavior of the nonwoven fabric in subdrain applications were discussed. These mechanisms were, in turn, related to induced filtration and internal grading of the soil near the soil-fabric contact surface. (See also W76-12451) (Sims-ISWSs)
W76-12459

DETERMINATION OF DISPERSIVE CLAY SOIL ERODIBILITY BY USING A PHYSICAL TEST,
Texas Univ. at Arlington.
T. M. Petry, and T. A. Haliburton.
In: Frost, Moisture, and Erosion; Transportation Research Record 532, Transportation Research Board, National Research Council, Washington, D.C., p 95-104, 1975. 8 fig, 1 tab, 6 ref.

Descriptors: *Erosion, *Soil erosion, *Dispersion, Groundwater movement, Soils, Clays, Laboratory tests, Instrumentation, Measurement, Soil chemistry, Soil engineering, Soil strength, Soil properties, Road construction, Civil engineering.
Identifiers: *Dispersive clay soils, Erosion tests, Erodibility, Internal erosion.

This paper introduced a new physical test method for identification of dispersive clay soil behavior. The significance of this form of internal erosion and the need for such a test were discussed. An analysis of dispersive clay soil behavior was included as a base for understanding the physical erosion test. The theoretical background, apparatus, and process of the proposed physical erosion test were presented. Data for average percentage of erosion were determined during 142 tests on 18 samples of varied properties. Physical erosion test results were correlated with those determined by a chemical property method and the method of plotting soil chemical data on a graph that has empirically derived zones of dispersive clay soil behavior. Correlations achieved were significant. It was concluded that dispersive clay soil behavior depends on the particular combination of chemical, physical, and mineralogical properties of the soil. The physical erosion test and the erosion device used were shown to provide the measure of dispersive clay soil erodibility needed by soils engineers to predict accurate field behavior. (See also W76-12451) (Sims-ISWS)
W76-12460

WATER YIELD MODEL USING SCS CURVE NUMBERS,
Agricultural Research Service, Temple, Tex.
For primary bibliographic entry see Field 2A.
W76-12522

MICROBIOLOGICAL CHARACTERIZATION OF THE LACUSTRINE DEPOSIT LAID OPEN BY DRYING UP OF THE GREACA LAKE, (IN ROMANIAN),
Institutul de Studii si Cercetari Pedologie, Bucharest (Rumania).
For primary bibliographic entry see Field 2J.
W76-12571

2H. Lakes

THE EFFECTS OF CADMIUM ON FRESHWATER PHYTOPLANKTON,
Vermont Univ., Burlington. Dept. of Biochemistry.
For primary bibliographic entry see Field 5C.
W76-12152

SOME ASPECTS OF STOCHASTIC RESERVOIR THEORY,
Monash Univ., Clayton (Australia).
For primary bibliographic entry see Field 4A.
W76-12197

THE TROPHIC STATE OF NORTH CAROLINA LAKES,
North Carolina Univ. at Chapel Hill. Dept. of Environmental Sciences and Engineering.
For primary bibliographic entry see Field 5C.
W76-12210

A LIMNOLOGICAL STUDY OF SPIRITWOOD LAKE, N. D., WITH SPECIAL EMPHASIS ON ITS WATER QUALITY, SEASONAL CYCLES OF CHEMICAL NUTRIENTS, PHYTOPLANKTON, ZOOPLANKTON AND PRIMARY PRODUCTION, PART I: PHOTOSYNTHETIC PRODUCTION AND ENERGY CONVERSION IN SPIRITWOOD LAKE, NORTH DAKOTA,
North Dakota State Univ., Fargo. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W76-12213

A LIMNOLOGICAL STUDY OF SPIRITWOOD LAKE, N. D., WITH SPECIAL EMPHASIS ON ITS WATER QUALITY, SEASONAL CYCLES OF CHEMICAL NUTRIENTS PHYTOPLANKTON, ZOOPLANKTON AND PRIMARY PRODUCTION, PART II: CAUSES AND CONTROL OF ALGAL BLOOMS IN SPIRITWOOD LAKE, NORTH DAKOTA,
North Dakota State Univ., Fargo. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W76-12214

A RED BLOOM IN HORN SO NEAR LEMVIG (N. W. JUTLAND), CAUSED BY THE DINOFLAGELLATE OXYRHIS MARINA, (IN DANISH),
Copenhagen Univ. (Denmark). Inst. of Plant Anatomy and Cytology.
For primary bibliographic entry see Field 5C.
W76-12264

THE INFLUENCE OF GRASS-CARP POPULATION (CTENOPHARYNGODON IDELLA VAL.) ON THE VEGETATION AND ECOSYSTEM OF LAKE TRAKOSCAN, (IN SERBO-CROATIAN),
Zagreb Univ. (Yugoslavia). Institut za Biologijo.
For primary bibliographic entry see Field 5C.
W76-12272

CONTRIBUTION TO EPIZOOTOLOGY OF SCHISTOCEPHALUS PUNGITII (LIGULIDAE) IN THE MANYCH-GUDILO LAKE, (IN RUSSIAN),
Rostov-on-Don State Univ. (USSR).
For primary bibliographic entry see Field 5C.
W76-12273

ON ENVIRONMENTAL FACTORS OF EEL POOLS: I. CHEMISTRY OF THE WATER AND SOIL AND PLANKTON IN OCTOBER 1965 AND JULY 1966, (IN JAPANESE),
Freshwater Fisheries Research Lab., Tokyo (Japan).
For primary bibliographic entry see Field 5C.
W76-12275

VERTICAL DISTRIBUTION, SESTONIC SEASONAL DYNAMICE AND THE ROLE OF DETRITUS IN THE LAKE DAL'NEYE ECOSYSTEM, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Institut Biologii Vnutrennykh Vod.
For primary bibliographic entry see Field 5C.
W76-12301

SESTON OF THE KIEV WATER RESERVOIR AND QUANTITATIVE RATIOS OF ITS COMPONENTS, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.
For primary bibliographic entry see Field 5C.
W76-12302

DISTRIBUTION OF TRACE ELEMENTS I BOTTOM SEDIMENTS OF THE KIEV RESE VOIR UKRAINIA SSR, USSR, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Instyt Hidrobiologii.
For primary bibliographic entry see Field 5B
W76-12305

DISTRIBUTION OF HETEROTROPHIC BA TERIA IN WATER AND BOTTOM DEPOSI OF THE KREMENCHUG RESERVOIR RELATION TO THE INTENSITY DEVELOPMENT OF BLUE-GREEN ALGAE, RUSSIAN),
Kiev State Univ. (USSR).
For primary bibliographic entry see Field 5C.
W76-12306

BACTERIOPLANKTON REPRODUCTION PHIALS WITH FILTERED WATER, (IN RU SIAN),
Akademiya Nauk SSSR, Chita. Transbaik. Co plex Expediton.
For primary bibliographic entry see Field 5C.
W76-12319

DESTRUCTION OF ORGANIC MATTER GROUNDS OF KAPCHAGAI RESERVOIR, RUSSIAN),
Akademiya Nauk Kazakhskoi SSR, Alma-A Inst. of Microbiology and Virology.
For primary bibliographic entry see Field 5C.
W76-12320

ON PHILLIPS' THEORY OF EQUILIBRIU RANGE IN THE SPECTRA OF WIN GENERATED GRAVITY WAVES,
Akademiya Nauk SSSR, Moscow. Institut O anologii.
S. A. Kitaigordskii, V. P. Krasitskii, and M. M. Zaslavskii.
Journal of Physical Oceanography, Vol 5, No 3 410-420, July 1975. 4 fig, 13 ref, 1 append.

Descriptors: *Wind tides, *Deep water, *Grav waves, *Distribution patterns, *Energy, Anal cal techniques, Theoretical analysis, Dispersi Model studies, Shallow water, Waves(Water).
Identifiers: *Spectral analysis, *Phillips' theo Random perturbations, Wave spectrum, Equili um range.

According to O. M. Phillips (1958, 1966) space time scale ranges can exist in the spectra of wi generated gravity waves within which the ene distribution must depend only on physical para ters characterizing the formation of sharp crest breaking waves. It was recently shown by Ban and Phillips (See W76-09874) that when l waves move across the surface there is a nonlin augmentation of the surface drift near the lo wave crests, so that short waves, superimposed the longer ones, can attain a reduced value of m imum amplitude at the point of incipient break This dynamical effect is in clear contradiction w the initial statement of Phillips' hypothesis on s tial equilibrium spectra. This fact, together w the effect of strongly intermittent nature of sh wave components, must be taken into accoun order to obtain a more complete and deta description of the high-frequency parts of wind-generated gravity wave spectrum. (Sim ISWS)
W76-12336

SEASONAL DYNAMICS OF THE PERIPHY MACROFAUNA IN CARP PONDS IN SOU WEST BOHEMIA,
Karlova Universita, Prague (Czechoslova Dept. of Hydrobiology.
R. Markosova.
Vestn Cesk Spol Zool. 38(4), p 251-270, 1974.

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escriptors: *Seasonal, *Ponds, Europe, *Carp, isheries, Larvae, *Diptera, Substrates, Biomass, patial distribution, Periphyton, Fish food organms.
lentifiers: *Cricotopus-Sylvestris, Czechoslovakia(Bohemia).

2 fish ponds, chironomid larvae were the most nportant component of the fauna living on suberged substrates. The most abundant species as Cricotopus gr. sylvestris, with maximum numers and biomass just under the surface. The inuence of some environmental factors upon the asonal and spatial distribution of the chironomid rvae is demonstrated and briefly discussed.--opyright 1975, Biological Abstracts, Inc.
76-12395

OPULATION DYNAMICS OF CLADOCERANS SUNFISH LAKE, ONTARIO,
aterloo Univ. (Ontario). Dept. of Biology.
S. Clark, and J. C. H. Carter.
n J Zool. 52(10), p 1235-1242, 1974.

escriptors: *Canada, *Crustaceans, Lakes, aphnia, Fish food organisms, Carrying capaci- Mortality, Reproduction, Aquatic animals.
entifiers: Daphnia-Retrocurva, Daphnia-Rosea, aphanosoma-Leuchtenbergianum, *Sunfish ke(Ontario).

vestigation of populations of Daphnia rosea, D. rocurva, and Diaphanosoma leuchtenbergium in Sunfish Lake, southern Ontario (Canada), ring 1969 indicated that, in the absence of predan, food supply was the major factor controlling pulation size and influencing population rameters. Generally with each species, a populan peak was preceded by a rise in fecundity, an rease in birth rate, and a fall in death rate. As carrying capacity of the environment in terms food was surpassed in the population numbers lined, fecundity dropped off and the death rate e. A strong negative correlation between fecun- and death rate was observed.--Copyright 5, Biological Abstracts, Inc.
6-12407

LD DETERMINATION OF THE DENSITIES LAKE ICE SHEETS,
nt Univ., Peterborough (Ontario). Dept. of ography.
primary bibliographic entry see Field 2C.
6-12429

KE ONTARIO CIRCULATION IN VEMBER,
ional Oceanic and AtmosphericAdministra-, Ann Arbor, Mich. Great Lakes Environmen-Research Lab.
. Pickett.
nology and Oceanography, Vol. 21, No. 4, p 611, July 1976. 2 fig, 7 ref.

criptors: *Lake Ontario, *Water circulation, kes, On-site investigations, Current meters, el studies, Mathematical models, Cur-s(Water), Winds, Storms, Temperature, Meament, Winter, Water temperature.
tifiers: *Gyres, International Field Year for Great Lakes, November.

Lake Ontario current meter study during ember 1972 showed counterclockwise circulawith higher speeds in the western portion of lake. Results from wind-driven numerical els run for comparison agreed in the western on, but showed a clockwise gyre in the eastortion of the lake. (Sims - ISWS)
-12430

E FORCES ON VERTICAL CIRCULAR INDER,
ago Bridge and Iron Co., Plainfield, Ill. ne Research and Development.

For primary bibliographic entry see Field 8B.
W76-12443

GROUND-WATER AND SURFACE-WATER RELATIONSHIPS IN THE GLACIAL PROVINCE OF NORTHERN WISCONSIN - SNAKE LAKE,
Adolph Coors Co., Golden, Colo.
For primary bibliographic entry see Field 5G.
W76-12444

AN HISTORICAL PERSPECTIVE OF NUTRIENT INPUTS AND TROPHIC STATES AS DEDUCED FROM CAYUGA LAKE SEDIMENTS,
Cornell Univ., Ithaca, N. Y. Dept. of Natural Resources.
For primary bibliographic entry see Field 5C.
W76-12463

MICROBIOLOGICAL TRANSFORMATION OF CARBON NITROGEN, SULFUR, IRON, PHOSPHORUS AND CALCIUM COMPOUNDS IN LAKE RESERVOIRS, (IN POLISH),
Polish Association of Sanitary Engineering and Technology, Warsaw.
For primary bibliographic entry see Field 5C.
W76-12494

PHOSPHATE RELEASE AND SORPTION BY LAKE MOHEGAN SEDIMENTS,
City Coll., New York. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5C.
W76-12512

A EUTROPHICATION MODEL FOR A LAKE,
Royal Danish School of Pharmacy, Copenhagen.
For primary bibliographic entry see Field 5C.
W76-12515

DOCUMENTATION OF SELECTED CONSTRUCTS AND PARAMETER VALUES IN THE AQUATIC MODEL CLEANER,
National Oceanic and Atmospheric Administration, Ann Arbor, Mich. Great Lakes Environmental Research Lab.
For primary bibliographic entry see Field 5C.
W76-12519

MICROBIOLOGICAL CHARACTERIZATION OF THE LACUSTRINE DEPOSIT LAID OPEN BY DRYING UP OF THE GREACA LAKE, (IN ROMANIAN),
Institutul de Studii si Cercetari Pedologie, Bucharest (Rumania).
For primary bibliographic entry see Field 2J.
W76-12571

GROWTH AND DISSIPATION OF PHYTOPLANKTON IN CHESAPEAKE BAY: I. RESPONSE TO A LARGE PULSE OF RAINFALL,
Johns Hopkins Univ., Baltimore, ,Md. McCollum-Pratt Inst.
For primary bibliographic entry see Field 5C.
W76-12572

SCHISTOSOMIASIS AND OTHER HUMAN PARASITOSES OF LAKE LINDU IN CENTRAL SULAWESI (CELEBES), INDONESIA,
For primary bibliographic entry see Field 5C.
W76-12573

THE EUTROPHICATION OF TITI LAKE AND ITS CONSEQUENCES FOR THE POPULATION OF DYNAMICS OF ZOOPLANKTON: 2, (IN GERMAN),
Universidad Austral de Chile, Valdivia. Instituto Zoologio.

For primary bibliographic entry see Field 5C.
W76-12594

METABOLIC RATES OF ARCTIC LAKES,
Atlantic Biological Station, St. Andrews (New Brunswick).
For primary bibliographic entry see Field 5C.
W76-12602

2I. Water In Plants

FOREST SOILS AND THE ASSOCIATED SOIL-PLANT WATER REGIME,
Forest Service (USDA), Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 2G.
W76-12239

CONTROLLING SOLAR LIGHT AND HEAT IN A FOREST BY MANAGING SHADOW SOURCES,
Forest Service (USDA), Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 4A.
W76-12241

ON HYDROBIOLOGY: CRITICAL MISAPPREHENSIONS CONCERNING THE DISCIPLINE, (IN HUNGARIAN),
Lajos Kossuth Univ., Debrecen (Hungary). Zoological Inst.
For primary bibliographic entry see Field 2A.
W76-12269

SURVIVAL OF WHITE AMUR LARVAE UNDER THE EFFECT OF ZINC SULFATE, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Inst. of Hydromechanics.
V. M. Sabodash.
Gidrobiol Zh. 10(6), p 93-96, 1974.

Descriptors: *Sulfates, *Larval growth stages, Larvae, Fish, Metabolism, Calcium, Fish management.
Identifiers: Ctenopharyngodon-idella, Minerals, *Zinc sulfate, *White amur.

The effect of zinc sulfate on the larval development stages of the white amur (Ctenopharyngodon idella) and the viability of larval changes as a result of this effect, with different contents of Ca in the water, were studied. Zn promotes incorporation in metabolism of Ca from the environment. The use of zinc sulfate during incubation of eggs and rearing the larvae of valuable fish species increased the fitness of their offspring which ultimately increases the yield of stocking material.--Copyright 1975, Biological Abstracts, Inc.
W76-12312

USE OF EMERGENCE DATA FOR ESTIMATING ANNUAL PRODUCTION OF AQUATIC INSECTS,
Oregon State Univ., Corvallis. Dept. of Entomology.
J. A. Speir, and N. H. Anderson.
Limnol Oceanogr. 19(1), p 154-156, 1974.

Descriptors: *Aquatic insects, Estimating, *Productivity, Diptera, Methodology.
Identifiers: Simuliidae, Black flies, Emergence(Insects).

Use of emergence data for aquatic insects is proposed as an indirect method of estimating production rate. Concurrent production and emergence estimates are compared for 4 spp. of black flies (Diptera:Simuliidae). The pooled production:emergence ratios for all 4 spp. were 4.3 in 1971 and 4.8 in 1972.--Copyright 1974, Biological Abstracts, Inc.

W76-12597

A COUNTERSTAINING TECHNIQUE FOR USE IN SORTING BENTHIC SAMPLES,
Waterloo Univ., (Ontario). Dept. of Biology.
D. D. Williams, and N. E. Williams.
Limnol Oceanogr. 19(1), p 152-154, 1974.

Descriptors: *Sampling, *Benthos, Analytical techniques, Detritus, Animals, Pollutant identification.
Identifiers: Chlorazol black, *Staining techniques, Rose bengal, Lugol's iodine.

Two staining techniques for use in benthic sample sorting are described. The primary stain, rose bengal or Lugol's iodine, is counterstained with chlorazol black to provide a high color contrast between the animal and detritus fractions of such samples.--Copyright 1974, Biological Abstracts, Inc.
W76-12606

2J. Erosion and Sedimentation

MAJOR FLOODS, POOR LAND USE DELAY RETURN OF SEDIMENTATION TO NORMAL RATES,
Forest Service (USDA), Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 4D.
W76-12157

EFFECT OF SEEPAGE ON EMBANKMENT DEFORMATIONS DUE TO WATER LOADING,
Sydney Univ. (Australia). School of Civil Engineering.
For primary bibliographic entry see Field 4A.
W76-12188

A UNIFORM MEASURE OF SUBAERIAL EROSION,
Colorado Univ., Boulder. Inst. of Arctic and Alpine Research; and Colorado Univ., Boulder. Dept. of Geography.
N. Caine.
Geological Society of America Bulletin, Vol. 87, No. 1, p 137-140, January 1976. 2 tab, 28 ref. USBR Contract No. 14-06-D-7052.

Descriptors: *Geomorphology, *Colorado, *Erosion, *Sediments, Sediment transport, Mudflow, Runoff, Topography, Rivers, Channel erosion.
Identifiers: *Alpine denudation, *Hillside erosion, Potential energy.

The use of geomorphic work as a measure of erosion intensity is illustrated. This allows direct comparisons of the effectiveness of erosion processes with other environmental exchages of energy or material and with relief factors. Because the measure facilitates the comparison of the results of fluvial and hillslope processes, it should be especially useful in situations where a geomorphic system can not be assumed to be in a steady state. An example from an alpine area in southwestern Colorado was used to illustrate the use of geomorphic work as a measure of erosion and to show how it may be compared to other environmental exchanges of material and energy. (Bhowmik - ISWS)
W76-12191

APPLICABILITY OF UNIT STREAM POWER EQUATION,
Army Engineer District, Chicago, Ill.
C. T. Yang, and J. B. Stall.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 102, No. HY5, Proceedings Paper 12103, p 559-568, May 1976. 8 fig, 12 ref, 2 append.

Descriptors: *Hydraulics, *Sediment transport, Streamflow, *Mississippi River, *Rivers, *Equations, Movement, Running waters, Open channel flow, Sediment discharge, Bottom sediments, Natural streams, *Rio Grand River, New Mexico, Nebraska, South Carolina.
Identifiers: *Unit stream power equation, *Sediment concentration(Rivers), Niobrara River(Neb), Coup River(Neb), Mountain Creek(SC).

The usefulness of a sediment transport equation to engineering depends on its applicability to natural rivers. Data collected from six river stations were used to compare the applicability of different equations. These comparisons indicated that the dimensionless unit stream power equation is the one which can provide accurate predictions of total sediment discharge in natural rivers under diversified flow and sediment condition. The limitations to which this dimensionless unit stream power equation can be applied are explained. (Lardner - ISWS)
W76-12193

MINERALOGY AND RELATED PARAMETERS OF FLUVIAL SUSPENDED SEDIMENTS IN NORTHWESTERN OHIO,
Guelph Univ., (Ontario).
G. J. Wall, and L. P. Wilding.
Journal of Environmental Quality, Vol. 5, No. 2, p 168-173, April-June 1976. 4 fig, 3 tab, 29 ref.

Descriptors: *Ohio, *Lake Erie, *Fluvial sediments, *Mineralogy, *Clay minerals, *Sediments, Physical properties, Water quality, Chemical properties, Water properties, X-ray diffraction, Quartz, Organic matter, Pesticides, Soil erosion, Trace elements, Silts, Fluvial sediments, Soil erosion, Suspended solids.
Identifiers: *Maumee River basin(Ohio), Blanchard River(Ohio), Outlet Creek(Ohio), Auglaize River(Ohio), *Suspended sediments, Sediment origin, Clay mineralogy, Northwestern Ohio, Mica, Carbonate mineralogy, Soil particles, Sediment pollution.

Stream water samples were collected weekly for 17 months at eight sampling sites in the Maumee River Basin to characterize the clay mineralogy of the suspended sediments and to determine the utility of mineralogy as a marker of the source (rural, urban, geologic) of the sediments. X-ray diffraction analysis of the clay-sized (less than or equal to 2 micrometers) sediments indicated little seasonal or downstream variability in clay mineral composition. The quantities of mica, quartz, and vermiculite-chlorite were 36 + or - 5%, 29 + or - 5%, and 20 + or - 5%, respectively. The quantities of expandables, interstratified, and kaolinite minerals were usually less than or equal to 10%. The 2 to 50 micrometer fraction was dominated by quartz in high flow periods and secondary calcite in low flow periods. When fluvial suspended sediment properties were compared to properties of regional soil materials, mineralogy appeared to be a useful index to differentiate between surficial and geologic (parent material) sources of suspended sediments. The mineralogical characterization of the fluvial suspended sediments in combination with chemical data led to the conclusion that the annual suspended sediment load of the Maumee River and tributaries was predominantly surficial in origin. (Henley - ISWS)
W76-12203

SEDIMENT DISCHARGE FROM HIGHWAY CUT-SLOPES IN THE LAKE TAHOE BASIN, CALIFORNIA, 1972-74,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 4C.
W76-12279

QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1970: PARTS 12-16. NORTH PACIFIC SLOPE BASINS, ALASKA, AND HAWAII AND OTHER PACIFIC AREAS.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W76-12284

MAP OF OVERDIP SLOPES THAT CAN AFFECT LANDSLIDING IN ARMSTRONG COUNTY, PENNSYLVANIA,
Geological Survey, Harrisburg, Pa.
For primary bibliographic entry see Field 7C.
W76-12300

DISTRIBUTION OF TRACE ELEMENTS IN BOTTOM SEDIMENTS OF THE KIEV RESERVOIR UKRAINIA SSR, USSR, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.
For primary bibliographic entry see Field 5B.
W76-12305

SAND LEVEL CHANGES ON TORREY PINES BEACH, CALIFORNIA,
Scripps Institution of Oceanography, La Jolla, Calif.
For primary bibliographic entry see Field 2L.
W76-12383

ORGANIC MATTER LOSSES FROM FOUR WATERSHEDS IN THE HUMID TROPICS,
East Carolina Univ., Greenville, N. C. Dept. of Biology.
For primary bibliographic entry see Field 5B.
W76-12428

REMOTE SENSING OF MISSISSIPPI RIVER CHARACTERISTICS,
Colorado State Univ., Fort Collins, Dept. of Civil Engineering.
For primary bibliographic entry see Field 7B.
W76-12442

FROST, MOISTURE, AND EROSION.
Transportation Research Board, Washington, D. C.
For primary bibliographic entry see Field 2G.
W76-12451

DETERMINATION OF DISPERSIVE CLAY SOIL ERODIBILITY BY USING A PHYSICAL TEST,
Texas Univ. at Arlington.
For primary bibliographic entry see Field 2G.
W76-12460

MICROBIOLOGICAL CHARACTERIZATION OF THE LACUSTRINE DEPOSIT LAID OPEN BY DRYING UP OF THE GREACA LAKE, (IN ROMANIAN),
Institutul de Studii si Cercetari Pedologie, Bucharest (Rumania).
P. Papacostea, S. Nastea, E. Popa, N. Petre, and C. Bondoc.
An Inst Stud Cercet Pedol. 40, p 197-213, 1972 (1974).

Descriptors: *Soil profile, *Bioindicators, *Bacteria, *Organic matter, Climates, Groundwater, Lakes, Microbiology, *Pseudomonas, *Azotobacter, Dehydration, Soil analysis, *Lake sediments, *Pollutant identification.
Identifiers: Azotobacter-Chroococcum, Bacillus-Subtilis, Dehydrogenase, Lacustrine, Pseudomonas-Aurantiaca, Pseudomonas-Lemonnieri, *Greaca Lake(Romania).

Two soil profiles, reclaimed 5 yr and 1 yr, respectively were characterized by a rich and varied microflora. The association of microbial indicators consisted of Bacillus subtilis, orange colored

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obacter chroococcum Pseudomonas lemon- and P. aurantiaca. The quantitative variations icteria and the dehydrogenase activity show cal fluctuations which, generally, are not re- to the depth, except at 0-5 cm, where an in- ed number of bacteria occur. The quantita- listribution reflects the lack of homogenity of ic matter distribution and the effects of cli- conditions and ground water level.--Copy- 1975, Biological Abstracts, Inc.
12571

Chemical Processes

OLVED NUTRIENT LOSSES IN STORM OFF FROM FIVE SOUTHERN PINE ERSHEDS,
ultural Research Service, Oxford, Miss. ientation Research Lab.
rimary bibliographic entry see Field 5B.
12172

CHEMISTRY OF 700 YEARS OF IPITATION AT DYE 3, GREENLAND,
Cold Regions Research and Engineering Hanover, N. H.
rimary bibliographic entry see Field 5A.
2181

ON CONTENTS OF SURFACE AND UN- ROUND WATERS IN SOUTH-CENTRAL ESOTA,
sota Univ., Minneapolis. Dept. of Civil and al Engineering.
imary bibliographic entry see Field 5A.
2202

MATIC DETERMINATION OF ATES BY AN IMPROVED NEPHELOMET- METHOD: APPLICATION TO THE RMINATION OF SO2 IN ATMOSPHERIC ND OF SULFATES IN RAIN WATER, (IN CH),
t d'Hygiene et d'Epidemiologie, Brussels m).
mary bibliographic entry see Field 5A.
2259

HE METHODS OF DETERMINING THE TE CONTENT OF WATER, AND THE RIPTION OF A NEW PHOTOMETRIC OD, (IN HUNGARIAN),
r-Kanalis. Komitats Hajdu-Bihar, Debrecen ry).
mary bibliographic entry see Field 5A.
2270

R AVAILABILITY OF MONROE COUN- ABAMA,
ical Survey, Tuscaloosa, Ala.
mary bibliographic entry see Field 4A.
281

TO THE AVAILABILITY OF OLOGIC DATA, GREATER PITT- H REGION, PENNSYLVANIA.
cal Survey, Harrisburg, Pa.
mary bibliographic entry see Field 7C.
282

TY OF SURFACE WATERS OF THE D STATES, 1970: PARTS 12-16. NORTH C SLOPE BASINS, ALASKA, AND I AND OTHER PACIFIC AREAS.
cal Survey, Reston, Va.
mary bibliographic entry see Field 7C.
284

GROUND-WATER RESOURCES IN THE LOMPOC AREA SANTA BARBARA COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 2F.
W76-12288

PRELIMINARY ANALYSIS OF GEOHYDROLOGIC DATA FROM TEST WELLS DRILLED NEAR CHALK POINT, PRINCE GEORGES COUNTY, MARYLAND,
Geological Survey, Parkville, Md.
For primary bibliographic entry see Field 4B.
W76-12289

GEOLOGY AND WATER RESOURCES OF BROWN COUNTY, SOUTH DAKOTA--PART II: WATER RESOURCES,
Geological Survey, Huron, S. Dak.
For primary bibliographic entry see Field 4A.
W76-12290

CHEMICAL CHARACTERISTICS OF THE MAJOR THERMAL SPRINGS OF MONTANA,
Geological Survey, Menlo Park, Calif.
R. H. Mariner, T. S. Presser, and W. C. Evans.
Open-file report 76-480, July 1976. 31 p, 2 fig, 10 tab, 26 ref.

Descriptors: *Geothermal studies, *Thermal springs, *Water chemistry, *Stable isotopes, *Montana, Water temperature, Warm springs, Hot springs, Deuterium, Oxygen isotopes, Carbon dioxide, Nitrogen, Argon, Hydrogen ion concentrations.
Identifiers: Aquifer temperatures, Geothermometers.

Twenty-one thermal springs in western Montana were sample for chemical, isotope, and gas compositions. Most of the springs issue dilute to slightly saline sodium-bicarbonate waters of neutral to slightly alkaline pH. A few of the springs issue sodium-mixed anion waters of near neutral pH. Fluoride concentrations are high in most of the thermal waters, up to 18 milligrams per liter, while F/Cl ratios range from 3/1 in the dilute waters to 1/10 in the slightly saline waters. Most of the springs are theoretically in thermodynamic equilibrium with respect to calcite and fluorite. Nitrogen is the major gas escaping from most of the hot springs; however, Hunters Hot Springs issue principally methane. The deuterium content of the hot springs waters is typical of meteoric water in western Montana. Geothermal calculations based on silica concentrations and Na-K-Ca ratios indicate that most of the springs are associated with low temperature aquifers (less than 100 degrees C). Chalcedony may be controlling the silica concentrations in these low temperature aquifers even in 'granitic' terranes. (Woodard-USGS)
W76-12293

GROUND-WATER RESOURCES OF LANE AND SCOTT COUNTIES, WESTERN KANSAS,
Geological Survey, Lawrence, Kans.
For primary bibliographic entry see Field 4B.
W76-12298

MAPS SHOWING GROUND-WATER CONDITIONS IN THE HARQUAHALA PLAINS AREA, MARICOPA AND YUMA COUNTIES, ARIZONA--1975,
Geological Survey, Tucson, Ariz.
For primary bibliographic entry see Field 7C.
W76-12299

WINTER HYDROCHEMICAL CONDITIONS OF SMALL RIVERS IN THE POLESYE OF THE UKRAINIAN SSR (THE PRIPYAT BASIN), (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.
For primary bibliographic entry see Field 5C.
W76-12303

SANITARY AND HYGIENIC EVALUATION OF THE WATER OF THE UZHGOROD WATER SUPPLY SYSTEM, (IN RUSSIAN),
For primary bibliographic entry see Field 5A.
W76-12313

LABORATORY COMPARISONS OF FOUR SURFACE MICROLAYER SAMPLERS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology.
R. F. Hatcher, and B. C. Parker.
Limnol Oceanogr. 19(1), p 162-165, 1974.

Descriptors: *Sampling, Data collections, Analytical techniques, *Laboratory equipment, Laboratory tests.
Identifiers: *Microlayer samplers.

The collection and recovery efficiencies of 4 surface microlayer samplers used by various investigator, compared under laboratory controlled conditions, reveal significant variations.--Copyright 1974, Biological Abstracts, Inc.
W76-12397

MULTIVARIATE ANALYSIS OF GEORGIA COASTAL PLAIN GROUNDWATERS,
Georgia Inst. of Tech., Atlanta. School of Geophysical Sciences.
For primary bibliographic entry see Field 2F.
W76-12466

WATER -- UNUSUAL RAW MATERIAL AT THE SERVICE OF THE PAPER INDUSTRY (L'EAU -- MATIERE PREMIERE ANORMALE AU SERVICE DU PAPETIER),
For primary bibliographic entry see Field 3E.
W76-12484

SEVERAL WATER CHEMISTRY DATA ON THE KNOWLEDGE OF THE SECTION OF THE DANUBE BETWEEN BUDAPEST AND TURNU SEVERIN (1645-930 KM) (DANUBIALIA HUNGARICA LXVII), (IN GERMAN),
Magyar Tudomanyos Akademia, Budapest. Station for Danube Research.
For primary bibliographic entry see Field 5A.
W76-12574

2L. Estuaries

FURTHER THERMAL ADDITION STUDIES AT CRYSTAL RIVER, FLORIDA WITH AN ANNOTATED CHECKLIST OF MARINE FISHES COLLECTED 1969-1971,
Florida Dept. of Natural Resources, St. Petersburg. Marine Research Lab.
For primary bibliographic entry see Field 5C.
W76-12163

HYDROGRAPHY AND PHYTOPLANKTON OF THE COAST OF CASTELLON, FROM SEPTEMBER 1969 TO JANUARY 1971, (IN SPANISH),
Instituto de Investigaciones Pesqueras, Barcelona (Spain).
For primary bibliographic entry see Field 5A.
W76-12164

MASS TRANSPORT IN GRAVITY WAVES ON A SLOPING BOTTOM,
Technische Hogeschool, Delft (Netherlands). Dept. of Civil Engineering.

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E. W. Bijker, J. P. Th. Kalkwijk, and T. Pieters.
Report 75-1. 125 p, 17 fig, 3 tab, 17 ref, 3 append.

Descriptors: *Sediment transport, *Coasts, *Ocean waves, *Velocity, *Hydraulics, Movement, Laboratory tests, Analytical techniques, Roughness(Hydraulic), Model studies, Gravity waves, Waves(Water), Slopes, mathematical models.
Identifiers: *Wave theory, *Drift velocities, Mass transport.

The influence of bottom slope on mass transport by progressive waves was investigated, both theoretically and experimentally. Theoretical considerations, based on linear wave theory, show the greatest influence of the slope on the bottom drift velocities for relatively long waves and steep slopes. The bottom drift velocities are most important for sediment transport in coastal areas. Experiments were carried out on three sloping bottoms. The general conclusions were: (1) the mass transport velocities at the bottom on the slopes seem to be determined by the local depth rather than by the slope-angle; (2) these velocities, predicted by the horizontal bottom theory, are too large for the sloping bottom; (3) the discrepancy between theory and experiment increases with decreasing depth and increasing relative wave length and wave height; (4) the inclusion of the change in wave form and slope effect appears to explain the behavior of the bottom velocities qualitatively; and (5) the drift velocities change slightly for increasing bottom roughness and considerably when a ripple-like roughness is present. (Singh - ISWS)
W76-12190

AN ORTHOGONALIZED CONVOLUTION METHOD OF TIDE PREDICTION,
Hawaii Inst. of Geophysics, Honolulu.
G. W. Groves, and R. W. Reynolds.
Journal of Geophysical Research, Vol. 80, No. 30, p 4131-4138, October 20, 1975. 4 fig, 5 tab, 12 ref. NSF GA-1117, GA-17137.

Descriptors: *Tides, *Oceans, *Analysis, *Hawaii, Gravity, Estuaries, Tidal effects, Equations, Diurnal, *Forecasting.
Identifiers: *England, *Tidal analysis, Tidal prediction, Orthogonal functions, Orthotides, Tidal admittance, Convolution method, Harmonic method.

Linear combinations of a set of special orthogonal tidal functions, referred to as orthotides, were proposed to represent the tidal input functions and the observed tide. These functions differed from the usual harmonic functions in that successive members correspond to successively more wiggly terms in the linear admittance function. As in convulotion method, the appropriate tidal constants were determined from the mean displaced products of the observed tide with the tidal input functions. Munk and Cartwright's analyses of 19 years of data from Honolulu, Hawaii and Newlyn, England were used to estimate the linear gravitational orthotide constants for those locations. The general decrease of magnitude with order of the orthotide constants indicated that the tidal admittance was relatively smooth. A procedure was outlined for a similar development of the bilinear tidal response. This orthogonal method was suggested for routine analysis and prediction. (Adams - ISWS)
W76-12192

THERMAL ANALYSIS OF FROZEN EMBANKMENT ISLANDS,
Puget Sound Naval Shipyard, Bremerton, Wash.
G. R. Bafus, and G. L. Guymon.
Journal of the Waterways, Harbors and Coastal Engineering Division, American Society of Civil Engineers, Vol. 102, No. WW2, Proceedings Paper 12139, p 123-139, May 1976. 7 fig, 25 ref, 2 append.

Descriptors: *Coastal engineering, *Islands, Oil wells, *Alaska, Freezing, *Offshore platforms, Ice, Equations, Sea ice, Shores, Coasts, Temperature, Cold regions, Cold weather construction, *Model studies, Mathematical models, *Finite element analysis, Structures, Mathematical studies, Civil engineering, Meteorology
Identifiers: *Man-made islands, *Barter Island(Alaska).

A two-dimensional finite element analysis of the thermal state of man-made frozen islands was presented. The model included an air-ground interface energy exchange simulator that incorporated available meteorological parameters for application to offshore areas in the Alaskan arctic. Comparison of simulations with analytical and available data indicated an accurate and efficient model. Two hypothetical island configurations were analyzed using actual meteorological data obtained at Barter Island, Alaska. Results suggested that islands constructed of dredged materials are feasible in shallow waters. (Sims - ISWS)
W76-12200

INCREASING THE MEAN CURRENT IN COASTAL CHANNELS,
Rosenstiel School of Marine and Atmospheric Science, Miami, Fla.
J. van de Kreeke.
Journal of the Waterways, Harbors and Coastal Engineering Division, American Society of Civil Engineers, Vol. 102, No. WW2, Proceedings Paper 12157, p 223-234, May 1976. 7 fig, 4 tab, 8 ref, 1 append.

Descriptors: *Channels, *Currents(Water), *Inlets(Waterways), *Tidal waters, Tides, Estuaries, Laboratory tests, Equations, Mathematical studies, Weirs, Flow.
Identifiers: *Waterways, Flushing, River currents, Tidal currents.

Results of previously published theoretical studies suggest that properly designed inlets and channel constrictions, or both, can considerably increase the mean current in coastal channels. This was further investigated by laboratory experiments in a channel of uniform width and depth at each end connected to the same tidal basin. A mean current was induced by providing one end of the channel with a constriction in the form of a submerged weir. Measured values for the mean current were in good agreement with values obtained by numerical integration of the governing hydrodynamic equations. For each experiment, the direction of the mean current was the same for each point in the vertical. The direction of the mean current was not the same for all experiments. To aid in the interpretation of the results, an approximate analytic expression for the mean current was derived. (Lee - ISWS)
W76-12201

SEA LEVEL COMPUTATIONS OF THE BALTIC WITH A 20-CANAL MODEL,
Fishery Board of Sweden, Goteborg. Hydrographic Dept.
A. Svansson, and J. Szaron.
Tellus, Vol. 27, No. 6, p 596-605, 1975. 4 fig, 15 ref.

Descriptors: *Oceans, *Sea level, *Water level fluctuations, *Hydrodynamics, *Currents(Water), Numerical analysis, Channel flow, Flow resistance, Estuaries, Equations, Mathematical models.
Identifiers: *Baltic Sea, *Kattegat, *Belt Sea, Wind stress, One-dimensional analysis.

The Kattegat, Belt Sea, and the Baltic Sea were treated as a branching system of one-dimensional canals. Sea levels and water transports were computed from the hydrodynamical equations, including terms of acceleration, wind stress, atmospheric pressure, tidal acceleration, and bottom friction. Some non-linear terms were retained. The sea water was assumed to be homogeneous. The co putations were made numerically by means of explicit difference model with 15-minute ti steps. Results of the computations were given f August 1-5, 1964, when international cooperati provided field data throughout the Baltic Se (Adams - ISWS)
W76-12205

COASTAL ENGINEERING CONFERENC FOURTEENTH. PROCEEDING COPENHAGEN, DENMARK, JUNE 24-28, 197
American Society of Civil Engineers, New York
For primary bibliographic entry see Field 5G.
W76-12221

ENVIRONMENTAL PROBLEMS ASSOCIATI WITH A PIPELINE LANDFALL IN COASTA DUNES AT CRUDEN BAY, ABERDEENSHIR SCOTLAND,
Aberdeen Univ. (Scotland).
For primary bibliographic entry see Field 5G.
W76-12223

OCEAN 72, IEEE INTERNATIONAL CO FERENCE ON ENGINEERING IN THE OCEA
Institute of Electrical and Electronics Enginee Inc., New York.
For primary bibliographic entry see Field 5G.
W76-12224

PROCEEDINGS OF THE TWENTY-EIGH ANNUAL GULF AND CARIBBEAN FISHER INSTITUTE.
Miami Univ., Fla.
For primary bibliographic entry see Field 6G.
W76-12226

TRACE METALS AND POLLUTION OF T BELGIAN COAST AND OF THE SCHE ESTUARY, (IN FRENCH),
Institut Royal des Sciences Naturelles Belgique, Brussels. Lab. for Oceanograp Physics.
For primary bibliographic entry see Field 5A.
W76-12260

DETERMINATION OF BORON IN DRINKI WATER FROM KOSZALIN PROVINCE, POLISH),
Medical Academy, Poznan (Poland). Inst. Chemistry and Analytics.
For primary bibliographic entry see Field 5A.
W76-12261

SUCCESSION OF PLANKTON DIATOMS TOKYO BAY, (IN JAPANESE),
Tokyo Univ. (Japan). Ocean Research Inst.
For primary bibliographic entry see Field 5C.
W76-12268

THE SHALLOW AQUIFER--A PRIME FRES WATER RESOURCE IN EASTERN PA BEACH COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 2F.
W76-12278

HYDROGRAPHY AND PHYTOPLANKT FROM THE BAY OF CADIZ, FROM JANUA OF 1970 TO DECEMBER OF 1973, SPANISH),
Instituto de Investigaciones Pesqueras, Ca (Spain). Laboratorio de Investigacio Pesqueras.
For primary bibliographic entry see Field 5A.
W76-12309

E MERCURY CONCENTRATION IN EELS GUILLA ANGUILLA) FROM THE ESTUA- OF THE GUADALQUIVIR RIVER AND TEROS' OF SALINES OF CADIZ BAY, (IN NISH),
ituto de Investigaciones Pesqueras, Dadiz in). Laboratorio de Investigaciones queras.
primary bibliographic entry see Field 5C.
-12321

ECTS OF A WASTE OF 'PAPER KRAFT' THE BENTHIC ALGAL POPULATIONS IN . SPAIN. 'STRESS' ON THE FUCACEAE NDING CROP, (IN SPANISH),
tuto de Investigaciones Pesqueras, Vigo in). Laboratorio de Investigaciones queras.
primary bibliographic entry see Field 5C.
-12327

ECTS OF COPPER ON SURVIVAL AND IOREGULATION IN MARINE AND CKISH WATER ISOPODS (CRUSTACEA),
rpool Univ., Port Erin (England). Dept. of ne Biology.
primary bibliographic entry see Field 5C.
-12333

PHILLIPS' THEORY OF EQUILIBRIUM GE IN THE SPECTRA OF WIND- ERATED GRAVITY WAVES,
lemiya Nauk SSSR, Moscow. Institut Oke- ogii.
primary bibliographic entry see Field 2H.
-12336

IC REMOTE SENSING INVESTIGATIONS BEACH RECONNAISSANCE: AN IN- IM REPORT,
ronmental Research Inst. of Michigan, Ann r.
Leu, C. T. Wezernak, P. Jackson, F.
nson, and R. Shuchman.
lable from the National Technical Informa- Service, Springfield, VA 22161 as AD-A013 $5.00 in paper copy, $3.00 in microfiche. nical Report No. 108900-3-T, August 1975. 91 fig, 15 tab, 19 ref, 3 append. ONR - N0014- 0273.

riptors: Continental Shelf, Resources opment, Environmental effects, *Remote ng, *Beaches, *Intertidal areas, *Radar, r quality control, *Instrumentation, Coasts, nos, Computer programs.
ifiers: Outer Continental Shelf, *Bottom graphy, *Optical sensor data, Offshore ology, Multispectral scanners.

ess is reported on three tasks designed to op remote sensing beach reconnaissance iques applicable to the benthic, beach inter- and beach upland zones. Task 1 is designed velop remote sensing indicators of important composition and physical parameters which ltimately prove useful in models to predict conditions. Task 2 is designed to develop e sensing techniques for survey of bottom es in the benthic zone. Task 3 is designed to op radar processing techniques to delineate tant beach intertidal and upland parameters better understand the potential of radar- d information when used with optical sensor (Sinha OEIS)
2375

ICTED OIL SLICK MOVEMENT FROM OUS LOCATIONS OFF THE NEW JER- DELAWARE COASTLINE,
Guard Research and Development Center, n, Conn.
imary bibliographic entry see Field 5B.
2376

AN IN-SITU INVESTIGATION OF OIL BARRIER SHAPE AND DRAG COEFFICIENTS,
Rhode Island Univ., Kingston. Dept. of Ocean Engineering.
For primary bibliographic entry see Field 5G.
W76-12378

SAND LEVEL CHANGES ON TORREY PINES BEACH, CALIFORNIA,
Scripps Institution of Oceanography, La Jolla, Calif.
C. E. Nordstrom, and D. L. Inman.
Available from the National Technical Information Service, Springfield VA 22161, as ADA-019 833, $6.75 in paper copy, $3.00 in microfiche. U. S. Army Corps of Engineers, Coastal Engineering Research Center Miscellaneous Paper No. MP-11-75, December 1975. 166 p, 10 fig, 10 ref, 8 append. DACW72-72-C-0020.

Descriptors: *Waves(Water), *Seasonal, *Water levels, *Beaches, Resources development, *Environmental effects, *Sediment transport, *Sea level, Coasts, Beach erosion, Sands, *California.
Identifiers: *Outer Continental Shelf, *Beach profiles, Wave regime, *Torrey Pines Beach(Calif).

Three parallel range lines were established along a straight beach at Torrey Pines, California, and were surveyed at monthly intervals during June 1972 to May 1974. Offshore sand level changes were measured using reference rods placed in the bottom at selected stations on each range line. Beach profile measurements indicate that the beach underwent seasonal changes in configuration which are related to changes in the wave regime. During the summer months the beach profile progressively changed with the seaward progradation of the berm crest by sand accretion. This change was caused by onshore transport of sand from immediately offshore depths of less than -20 feet (-6.1 meters) relative to MSL. The transition from the summer to the winter beach profile was abrupt with the coincident occurrence of high waves and tides. Periods of high waves during high tides resulted in wave swash overtopping the berm crest and quickly eroding the beach. The rapid shoreward retreat of the berm crest caused by the offshore transport of sand was accompanied by a corresponding deposition of sand offshore at depths less than -30 feet (-9 meters) relative to MSL. (Sinha-OEIS)
W76-12383

MESOSCALE SPATIAL AND TEMPORAL VARIATIONS OF WATER MASS CHARACTERISTICS IN THE CALIFORNIA CURRENT REGION OFF MONTEREY BAY IN 1973-1974,
Naval Postgraduate School, Monterey, Calif.
R. E. Blumberg.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-019 283, $6.00 in paper copy, $3.00 in microfiche. Master's Thesis, September 1975. 142 p, 19 fig, 2 tab, 10 ref, 8 append.

Descriptors: Water properties, *Currents(Water), *California, Data processing, *Profiles, Coasts, Bays, *Pacific Ocean, *Salinity, Water temperature, *Variability, Spatial distribution, Temporal distribution.
Identifiers: *California Current system, Mesoscale variations, Water masses, *Monterey Bay(CA), Salinity profiles.

Continuous salinity and/or temperature profiles were made off the coast of Monterey Bay monthly between August 1973 and August 1974 and on a spatial grid finer than is conventionally used. A procedure is described to convert the data from analog to digital form, process these data on an IBM 360 computer, and print out the results by station for each month. The results show water mass features of small spatial scale detectable only because of the small grid spacing. A gyre or filament structure is suggested by the north to south variation between lines of stations. The extent of the area of survey is insufficient to describe completely the water mass structure on both the eastern and western boundaries; however, the temporal variation in the observed water mass structure is consistent with the three oceanographic seasons described for the California Current system. Elements of relatively cold water and relatively warm water masses are identified in the area of survey. (Sinha-OEIS)
W76-12386

MESOSCALE COMPONENT OF THE GEOSTROPHIC FLOW AND ITS TEMPORAL AND SPATIAL VARIABILITY IN THE CALIFORNIA CURRENT OFF MONTEREY BAY IN 1973-74,
Naval Postgraduate School Monterey, Calif.
R. E. Greer.
Available from the National Technical Information Service, Springfield, Va 22161 as AD-A019 284, $7.50 in paper copy, $3.00 in microfiche. Master's Thesis, September 1975. 179 p, 13 ref.

Descriptors: *Continental Shelf, Water property, *Flow characteristics, *Currents(Water), *California, Water resources, Salinity, Water circulation, *Pacific Ocean, Variability, Spatial distribution, Temporal distribution.
Identifiers: *Outer Continental Shelf, *Geostrophic flow, *Bottom topography, Seasonal variations, Mesoscale component, Surface currents, Salt transport, *Monterey Bay(CA).

The mesoscale components of the geostrophic flow and its temporal and spatial variability are discussed for the oceanic region west of the continental shelf off Monterey Bay. The results were obtained from spatially dense observations on thirteen cruises between August 1973 and August 1974. Patterns of current flow indicated by drogues and geostrophy tend to confirm an analysis of the structure which has alternating element of poleward and equatorward flow. Surface current flow patterns are similar to those found at depths to 375 m. The bottom topography influences the direction of flow inside the 1,000 fathom curve. Seasonal variations of the geostrophic flow and salt transport were congruent with Skogsberg's (1936) annual cycle composed of three distinct oceanographic seasons. The flow and structure in the area are complex with flow elements less than 10 km in width. The data suggest that observations on a sampling grid length less than 10 km transverse to the current flow, and extensive independent current measurements are required to describe adequately the small-scale features of the flow, structure and its time variations. (Sinha-OEIS)
W76-12387

ANALYSIS OF THE ROLE OF THE GULF INTRACOASTAL WATERWAY IN TEXAS,
Texas Engineering Experiment Station, College Station.
For primary bibliographic entry see Field 5G.
W76-12389

ENVIRONMENTAL IMPLICATIONS OF MAINTENANCE AND IMPROVEMENT OF THE GULF INTRACOASTAL WATERWAY IN TEXAS,
Texas A and M Univ., College Station. Coll. of Agriculture.
For primary bibliographic entry see Field 5G.
W76-12390

AN ALTERNATE GRAZING HYPOTHESIS FOR THE PATUXENT ESTUARY,
Maryland Univ., Solomons. Chesapeake Biological Lab.
D. R. Heinle.
Chesapeake Sci. 15(3), p 146-150, 1974.

Descriptors: *Maryland, Estuaries, *Energy budget, Copepods, *Jelly fish, Phytoplankton, Zooplankton, *Fish food organisms.
Identifiers: *Ctenophore, *Patuxent estuary(Md).

A substantial error in an earlier paper led Miller and Williams to conclude that there was insufficient phytoplankton and zooplankton in the Patuxent estuary, Maryland, to support the populations of ctenophores and jellyfish. Calculations of a revised energy budget suggests that there may, at times, be insufficient zooplankton, but that phytoplankton stocks are more than adequate for the needs of the ctenophores, the jellyfish and the copepods.--Copyright 1974, Biological Abstracts, Inc.
W76-12396

TIDE-POWERED ELECTRICAL GENERATOR,
For primary bibliographic entry see Field 8C.
W76-12403

INFLUENCE OF SURFACE WAVES ON SUBSURFACE CURRENT MEASUREMENTS IN SHALLOW WATER,
National Oceanic and Atmospheric Administration, Seattle, Wash. Pacific Marine Environmental Lab.
D. Halpern, and R. D. Pillsbury.
Limnology and Oceanography, Vol. 21, No. 2, p 611-616, July 1976. 5 fig, 12 ref. NSF GS-28746, GS-33502, AG-299.

Descriptors: *Ocean currents, *Ocean circulation, *Pacific Ocean, *Oregon, Coasts, Continental shelf, *Currents(Water), Current meters, Time series analysis, On-site investigations, Measurement, *Waves(Water).
Identifiers: *Aanderaa current meters.

Aanderaa current-meter readings were taken at 43 m at two sites 0.2 km apart in water 50 m deep near the central Oregon coast. The uppermost extensions of the subsurface moorings were about 3 and 18 m deep. During a 25-day period in July and August 1973, mean speeds differed by about 47%. For low frequencies (less than 0.7 cph) there was a 1:1 correspondence between the shapes of the kinetic-energy density spectra. For all frequencies, spectral density estimates of the data recorded beneath the deeper placed topmost float were lower than the estimates of the other data. The effect of surface wave motion on Aanderaa current measurements was discussed. (Sims - ISWS)
W76-12431

CHEMICAL AND MICROBIOLOGICAL DEGRADATION OF MALATHION AND PARATHION IN AN ESTUARINE ENVIRONMENT,
Gulf Coast Research Lab., Ocean Springs, Miss. Microbiology Section.
For primary bibliographic entry see Field 5B.
W76-12437

INTERACTION OF WATER WAVES WITH CYLINDER BARRIER,
Polish Academy of Sciences, Gdansk. Inst. of Hydraulic Research.
For primary bibliographic entry see Field 8B.
W76-12441

WAVE FORCES ON VERTICAL CIRCULAR CYLINDER,
Chicago Bridge and Iron Co., Plainfield, Ill. Marine Research and Development.
For primary bibliographic entry see Field 8B.
W76-12443

OXYGEN ISOTOPE STUDIES ON SEA ICE IN THE GULF OF ST. LAWRENCE,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia). Atlantic Oceanographic Lab.
For primary bibliographic entry see Field 2C.
W76-12448

IMPACT OF HURRICANE TIDAL SURGES ON SUBSEQUENT LAND USE CHANGES AND WATER RESOURCES REALLOCATION,
University of Southern Mississippi, Hattiesburg. Dept. of Geography and Area Development.
For primary bibliographic entry see Field 4A.
W76-12461

SOME OBSERVATIONS ON THE CONTAMINATION OF THE COASTAL WATERS OF THE CITY OF CUMANA, (IN SPANISH),
Universidad de Oriente, Cumana (Venezuela). Inst. of Oceanography.
For primary bibliographic entry see Field 5B.
W76-12467

EVALUATION OF PROPOSED SEWAGE SLUDGE DUMPSITE AREAS IN THE NEW YORK BIGHT.
National Oceanic and Atmospheric Administration, Boulder, Colo. Marine Ecosystems Analysis Program Office.
For primary bibliographic entry see Field 5E.
W76-12469

SOME REMARKS ON THE UNUSUAL BEAUFORT SEA ICE CONDITIONS IN SUMMER 1975,
Alaska Univ., College. Geophysical Inst.
For primary bibliographic entry see Field 2C.
W76-12470

AN IMPROVED IN SITU PH SENSOR FOR OCEANOGRAPHIC AND LIMNOLOGICAL APPLICATIONS,
California Univ., Los Angeles. Dept. of Geology.
For primary bibliographic entry see Field 7B.
W76-12479

LARGE SCALE SYSTEMS APPROACH TO ESTUARINE WATER QUALITY MODELLING WITH MULTIPLE CONSTITUENTS,
Texas Univ. at Austin. Dept. of Electrical Engineering.
For primary bibliographic entry see Field 5B.
W76-12517

AN INTERDISCIPLINARY MATHEMATICAL MODEL APPLIED TO THE SOUTHERN BIGHT OF THE NORTH SEA,
Liege Univ. (Belgium). Institut de Mathematique.
For primary bibliographic entry see Field 5B.
W76-12518

ANOTHER VIEW OF OFFSHORE OIL AND GAS OPERATIONS.
For primary bibliographic entry see Field 5G.
W76-12577

HYDROCARBON RESIDUES IN IVORY COAST WATERS,
For primary bibliographic entry see Field 5C.
W76-12579

THE LINKAGE BETWEEN CHEMICAL POLLUTION AND BACTERIOLOGICAL POLLUTION IN COASTAL ZONES. (RECHERCHE D'UNE LIAISON ENTRE LA POLLUTION CHIMIQUE ET LA POLLUTION BACTERIOLOGIQUE DANS LES ZONES LITTORALES),
Commissariat a l'Energie Atomique, Pierrelatte (France).
For primary bibliographic entry see Field 5B.
W76-12590

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

1973-1974 SALINE WATER CONVERSION SUMMARY REPORT.
Office of Saline Water, Washington, D. C.
Available from the Supt. of Documents, GPO Washington, DC 20402, $1.55. Report, 1974. 64 25 fig, 6 tab, 4 append.

Descriptors: *Saline water, *Research a development, *United States, *Desalinatio Desalination apparatus, Desalination plan Desalination processes, Freezing, Membra processes, Mexican water treaty, Colorado Riv Pilot plants, Federal government, Reverse osm sis, Ion exchange, Dialysis, Brackish water, S water, Research facilities, Projects, On-site vestigations.
Identifiers: Wellton-Mohawk irrigation a drainage district.

Negotiations between the United States and Me ico to resolve the salinity problems of Colorado River at the International Bounda have resulted in an agreement calling for delive of water at Morelos Dam (where most of Mexic irrigation water is diverted from the Colorad which does not exceed in salinity by more than + or - 30 parts per million the water which arri at the Imperial Dam from the Colorado River. T main item in the proposed solution is the constr tion of the world's largest desalting plant, whi will treat the return flows from the Wellt Mohawk Irrigation and Drainage District. The O fice of Saline Water (OSW) established a small t facility near Yuma, Arizona, on the banks of t Wellton-Mohawk Drain. Seven manufacturers brackish water desalting equipment, at their o expense, have located pilot plants at the site. OS is also conducting experimental development wo at the Roswell, New Mexico, brackish water t facility. At present, major emphasis is bei placed on the development of membra processes for sea water, on the freezing process and on other new processes that are emergi from basic research efforts. The work and acco plishments of OSW's research and developme program in the past year were summariz (Robinson - ISWS)
W76-12343

HYGIENIC EVALUATION OF ELECTRODIA YSIS WATER DESALINATION SET UP, (RUSSIAN),
Moskovskii Gosudarstvennyi Meditsinskii Insti (I) (USSR). Dept. of General Hygiene; a Moskovskii Gosudarstvennyi Meditsinskii Insti (I) (USSR). Dept. of Public Hygiene.
For primary bibliographic entry see Field 5D.
W76-12394

REVERSE OSMOSIS SYSTEM WITH AUT MATIC FLUSHING,
Desalination Systems, Inc., Escondido, Ca (Assignee).
For primary bibliographic entry see Field 5D.
W76-12402

CONSTRUCTION AND OPERATION OF HIG PRESSURE FILTERS WITH MOLECULA SIEVES (BUDOWA I DZIALAN WYSOKOCISNIENIOWYCH FILTROW SITAMI MOLEKULARNYMI),
Technical Univ., Lodz (Poland). Inst. of Pap making and Paper Machinery.
For primary bibliographic entry see Field 5D.
W76-12509

LIBRARY U. OF I. URBANA-CHAMPAIGN

3. Water Yield Improvement

ATER YIELD IMPROVEMENT RESEARCH
THE PACIFIC SOUTHWEST FOREST AND
NGE EXPERIMENT STATION AND ITS
EFULNESS TO WILDLAND RESOURCE
ANAGEMENT,
rest Service (USDA), Berkeley, Calif. Pacific
thwest Forest and Range Experiment Station.
primary bibliographic entry see Field 4C.
6-12170

E AWS HANDBOOK OF GROUND-BASED
LD FOG DISSIPATION USING VENTED
UID PROPANE, VOLUME I - THEROY AND
ACTICE.
Weather Service, Scott AFB, Ill.
ort AWS-TR-75-255, July 1975. 55 p, 23 fig, 2
16 ref, append. Chary, H.A., and Lininger,
., editors.

criptors: *Weather modification, *Fog,
pane, Airports, Operation and maintenance,
ospheric physics, Particle size, Drops(Fluids),
perature, Climatology, Meteorology, Physics,
ineering.
tifiers: *Cold fog, *Fog dissipation, Visibility.

theory and practice of ground-based cold fog
pation using vented liquid propane were ex-
ied. The cumulative Air Weather Service ex-
se in ground-based cold fog dissipation was
marized. The following observations were
e: Cold fog dissipation is dependent on the
e transition of liquid water to ice. The ice
e is initiated by severe local cooling due to the
atic expansion of vented liquid propane. The
rystals grow at the expense of the supercooled
roplets and fall out, thus effecting a clearing.
e operational cold fog dissipation networks
illustrated. Generalized guidance for
ing, procuring, installing, and operating a
fog dissipation system were given. (Sims -
S)
12471

OBREAKS MAY INCREASE WATER
D FROM THE GRASSLAND ISLANDS IN
ONA'S MIXED CONIFER FORESTS,
t Service (USDA), Tempe, Ariz. Forest
ology Lab.; and Forest Service (USDA),
e, Ariz. Rocky Mountain Forest and Range
riment Station.
Thompson, O. D. Knipe, and P. M. Johnson.
ydrology and Water Resources in Arizona
ne Southwest Vol. 6, p 323-329, Proceedings
Meeting of the Arizona Section, American
Resources Association and Hydrological
n, Arizona Academy of Sciences (Tuscon,
na), April/May, 1976. 9 fig, 3 ref.

iptors: *Water yield improvement,
slands, *Arizona, *Windbreaks, Water
Water supply, Snowpacks, Forest manage-
Watershed management, Hydrologic pro-
, Climates, Soil properties, Trees, Soil
Snow, Snow cover.
iers: Mycorrhiza.

eneral hydrologic characteristics, selected
c factors, and soil properties of the high-
on grasslands are compared to the sur-
ng forest. Water yield could be increased by
inches if snow could be held where it falls.
be possible to establish tree windbreaks in
ssland by altering the microclimate during
shment, and introducing mycorrhiza with
nted seedlings. (Witt-IPC)
2477

3C. Use Of Water Of Impaired Quality

QUALITY OF POTATOES GROWN ON FIELDS IRRIGATED WITH WASTEWATERS OF COAL-TAR CHEMICAL AND METALLURGICAL PLANTS, (IN RUSSIAN),
Kiev Inst. of Nutritional Hygiene (USSR).
For primary bibliographic entry see Field 5C.
W76-12355

HYGIENIC EVALUATION OF POTATOES GROWN IN SOIL IRRIGATED WITH EFFLUENTS FROM COKING AND CHEMICAL PLANTS OF THE DONETS COAL BASIN, (IN RUSSIAN),
Kiev Inst. of Nutritional Hygiene (USSR).
For primary bibliographic entry see Field 5C.
W76-12369

WASTEWATER RESOURCES IN NORTH CENTRAL TEXAS,
Camp, Dresser and McKee, Inc., Boston, Mass.
For primary bibliographic entry see Field 5G.
W76-12652

3D. Conservation In Domestic and Municipal Use

SANITARY AND HYGIENIC EVALUATION OF THE WATER OF THE UZHGOROD WATER SUPPLY SYSTEM, (IN RUSSIAN),
For primary bibliographic entry see Field 5A.
W76-12313

3E. Conservation In Industry

EXPERIENCE IN DECONTAMINATION OF INDUSTRIAL WASTES AND TREATMENT PLANT SEDIMENTS IN LENINGRAD, (IN RUSSIAN),
For primary bibliographic entry see Field 5D.
W76-12291

METHODS FOR REMOVING FLUOBORATES FROM AQUEOUS MEDIA,
Galson Technical Services, Inc., Syracuse, N.Y. (Assignee).
For primary bibliographic entry see Field 5D.
W76-12398

METHOD FOR SLUDGE TREATMENT,
System AB Infoteknik, Vasteras (Sweden). (Assignee).
For primary bibliographic entry see Field 5D.
W76-12410

CHEMICALS AND ALLIED PRODUCTS (LITERATURE REVIEWS),
Union Carbide Corp., South Charleston, W. Va.
For primary bibliographic entry see Field 5D.
W76-12412

$10-MILLION AGGREGATE PLANT RECYCLES PROCESS WATER,
Acres Consulting Services Ltd., Vancouver (British Columbia).
For primary bibliographic entry see Field 5D.
W76-12414

PETROLEUM PROCESSING WASTES, (LITERATURE REVIEWS),
Weston (Roy F.), Inc., West Chester, Pa.
For primary bibliographic entry see Field 5D.
W76-12415

THE CLOSED-CYCLE BLEACHED KRAFT PULP MILL,
Toronto Univ. (Ontario).
For primary bibliographic entry see Field 5D.
W76-12417

ZERO DISCHARGE AS EXEMPLIFIED BY TEXTILE DYEING AND FINISHING,
Clemson Univ., S. C. Coll. of Industrial Management and Textile Science.
For primary bibliographic entry see Field 5D.
W76-12421

TANNERY WASTE MANAGEMENT, (LITERATURE REVIEWS),
Cincinnati Univ., Ohio. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 5D.
W76-12423

SOME WASTE TREATMENT PROBLEMS IN THE HIDE AND LEATHER INDUSTRIES,
For primary bibliographic entry see Field 5D.
W76-12424

NEW BEAMHOUSE DEVELOPMENT TO SIMPLIFY TANNERY WASTE WATER MANAGEMENT,
Instituut TNO voor Leder en Schoenen, Waalwijk (Netherlands).
For primary bibliographic entry see Field 5D.
W76-12427

UTILIZATION OF CLEAR WATER SEWAGE EFFLUENT IN MINERAL PROCESSING,
Arizona Bureau of Mines, Tucson.
For primary bibliographic entry see Field 5D.
W76-12464

MILL EFFLUENT TREATMENT AND FIBER RECOVERY.
For primary bibliographic entry see Field 5D.
W76-12474

WATER -- UNUSUAL RAW MATERIAL AT THE SERVICE OF THE PAPER INDUSTRY (L'EAU -- MATIERE PREMIERE ANORMALE AU SERVICE DU PAPETIER),
J. Vilars.
Papier, Carton et Cellulose, Vol. 25, No. 4, p 40-51, April, 1976. 20 fig, 1 tab.

Descriptors: *Water chemistry, *Water properties, *Water structure, *Pulp and paper industry, Surface tension, Viscosity, Ionization, Hydrogen ion concentration, Oxidation-reduction potential, Chemical properties, Physical properties, Water, Industrial water, Electrical properties.

Water is discussed with respect to chemical structure, physical properties (different states and heat energies, surface tension, viscosity, dielectric constant), and chemical properties (dissolving power, ionization and pH, redox potential), with emphasis on the importance of the various properties in papermaking applications of water. (Speckhard-IPC)
W76-12484

REMOVAL AND RECOVERY OF PHENOLS FROM INDUSTRIAL WASTE EFFLUENTS WITH AMBERLITE XAD POLYMERIC ADSORBENTS,
Rohm and Haas Co., Philadelphia, Pa.
For primary bibliographic entry see Field 5D.
W76-12487

FIRST CLOSED-CYCLE KRAFT MILL,
For primary bibliographic entry see Field 5D.
W76-12488

MONADNOCK CLEANS UP: SPECIALTY PAPER MILL INSTALLS $1-MILLION WASTE TREATMENT SYSTEM.
For primary bibliographic entry see Field 5D.
W76-12490

CONTAINER CORP. BOXBOARD PLANT INSTALLS CLARIFICATION, SLUDGE RECYCLING SYSTEM.
For primary bibliographic entry see Field 5D.
W76-12491

PAPER MILL WASTE SLUDGE OXIDATION AND PRODUCT RECOVERY,
Sterling Drug, Inc., New York. (Assignee).
For primary bibliographic entry see Field 5D.
W76-12493

METHOD FOR TREATING HEMI CAUSTIC EFFLUENTS,
ITT Industries, Inc., New York.
For primary bibliographic entry see Field 5D.
W76-12495

IMPROVEMENTS TO PROCESSES FOR PURIFYING EFFLUENTS ORIGINATING FROM THE MANUFACTURE AND BLEACHING OF CHEMICAL OR SEMICHEMICAL PAPERMAKING PULPS (PERFECTIONNEMENT AUX PROCEDES D'EPURATION DES EFFLUENTS PROVENANT DE LA FABRICATION ET DU BLANCHIMENT DES PATES A PAPIER DITES CHIMIQUES OU SEMI-CHIMIQUES),
For primary bibliographic entry see Field 5D.
W76-12498

PROCESS FOR PRECLEANING INDUSTRIAL WASTE WATER RESULTING FROM THE PROCESSING OF WATER-SOLUBLE PHENOLIC RESINS OR UREA-FORMALDEHYDE RESIN SOLUTIONS (VERFAHREN ZUR VORREINIGUNG VON BEI DER VERARBEITUNG VON WASSERLOESLICHEN PHENOLISCHEN RESOLEN ODER VON HARNSTOFF-FORMALDEHYDHARZLOESUNGEN ANFALLENDEM INDUSTRIEABWASSER),
For primary bibliographic entry see Field 5D.
W76-12504

3F. Conservation In Agriculture

ECONOMIC COSTS OF CONTROLLING WATER QUALITY THROUGH MANAGEMENT OF IRRIGATION RETURN FLOWS,
Washington State Univ., Pullman. Coll. of Agriculture.
For primary bibliographic entry see Field 5G.
W76-12218

WATER PRODUCTION FUNCTIONS AND PREDICTED IRRIGATION PROGRAMS FOR PRINCIPAL CROPS AS REQUIRED FOR WATER RESOURCES PLANNING AND INCREASED WATER USE EFFICIENCY,
California Univ., Davis. Dept. of Water Science and Engineering.
J. I. Stewart, R. M. Hagan, and W. O. Pruitt.
Final Report No. 14-06-D-7329, July 1976. 80 p, 17 fig, 18 tab, 17 ref. USBR 14-06-D-7329.

Descriptors: Irrigation programs, Water requirements, Optimization.
Identifiers: *Evapotranspiration, Crops, Beans, Planning, *Irrigation efficiency, Crop production, Water supply, Alfalfa, Grain sorghum, Water utilization.

1973 was a 'payoff' year in that procedures developed with corn in the 1969-72 period enabled gathering of all desired data for pinto beans in the single year, as well as finalizing information for grain sorghum. Alfalfa studies constituted the first year with a perennial crop having an established root system. Nevertheless, this experiment also provided information useful for practical water use planning. Principal developments for pinto beans, grain sorghum, and (earlier) corn are: (1) Yield versus evapotranspiration (ET) functions which quantify minimum yield loss expectations at all ET deficit levels. In relative value form these functions are transferable for guidance of several kinds of crop and water management decisions at other sites. Their use to select among crops for profit maximization in differing water supply circumstances is illustrated. (2) Determination of sensitivities of crop growth stages to ET deficits. (3) Methods of estimating expected ET deficits in different cropping circumstances. (4) Two models which utilize estimates of anticipated ET deficits and growth stage sensitivities to predict actual ET and yield for the season. Alfalfa soil water uptake patterns are used to illustrate calculation frequencies required to satisfy ET demands, based on soil depth and water holding capacity. (Bureau of Reclamation)
W76-12236

EVERY-OTHER FURROW IRRIGATION OF CORN,
Nebraska Univ., Lincoln. Dept. of Agricultural Engineering.
P. E. Fischbach, and H. R. Mulliner.
Transactions of the American Society of Agricultural Engineers, Vol. 17, No. 3, p. 426-428, May-June 1974. 4 tab, 9 ref.

Descriptors: *Corn(Field), *Irrigation practices, Irrigation effects, *Irrigation efficiency, *Furrow irrigation, Surface irrigation, Agriculture, Water conservation.

Every-other furrow irrigation was compared with every furrow irrigation on several soil types in Nebraska under various rainfall conditions. Analysis of the data shows no significant differences at the 5 percent level in corn grain yields on any soil texture when comparing every-other furrow with every furrow irrigation using 2 1/3 to 12-hr. irrigation sets. Further analysis of the data shows that the irrigation water moves laterally from the irrigated furrow to the adjacent dry furrow to a depth of 3 feet even with a 2 1/3-hr. irrigation set. Therefore, both manually and automated irrigation systems can be designed for every-other furrow irrigation. (Skogerboe-Colorado State)
W76-12371

SAMPLING AND CALCULATION METHODS FOR DETERMINING QUANTITIES OF NITROGEN AND PHOSPHORUS IN WATERSHED RUNOFF,
Agricultural Research Service, Columbia, Mo.
For primary bibliographic entry see Field 5A.
W76-12372

FUNDAMENTALS OF PROGRAMMED SOIL MOISTURE DEPLETION,
Nebraska Univ., Mitchell. Scotts Bluff Experiment Station.
D. W. Fonken, and P. E. Fischbach.
Presented at 1974 Winter Meeting of the American Society of Agricultural Engineers, December 10-13, 1974. Chicago, Illinois. 4 fig, 11 ref.

Descriptors: *Scheduling, Soil moisture, Water utilization, Irrigation, Irrigation practices, Irrigation operation and management, Energy.
Identifiers: *Soil moisture depletion, *Irrigation scheduling.

Programmed soil moisture depletion is an irrigation scheduling policy for achieving improved water use efficiency and energy savings. It requires medium or fine textured soils, irrigation hardware that can apply small controlled amounts of water, a climate and/or irrigation supply which can provide off-season rainfall and irrigation, and a relatively high level of irrigation management. It is recommended as a technique to reduce peak season irrigation requirements by utilizing previously wasted rainfall and off-season irrigation capability. (Skogerboe-Colorado State)
W76-12373

SPRINKLER IRRIGATION DESIGN CRITERIA FOR SUGAR BEETS,
Nebraska Univ., Mitchell. Scotts Bluff Experiment Station.
D. W. Fonken, J. C. Steele, and P. E. Fischbach.
Transactions of the American Society of Agricultural Engineers, Vol. 17, No. 5, p 889-891, September-October 1974. 5 tab, 7 ref.

Descriptors: *Sprinkler irrigation, *Irrigation design, Irrigation practices, *Design criteria, *Sugar beets, Consumptive use, *Nebraska, Crop response.

A solid set sprinkler system was used to simulate center pivot sprinklers in a search for the smallest design capacity which would not reduce yields of irrigated sugar beets. The peak daily consumptive use of sugar beets in western Nebraska is about 0.33 in. per day. A system with the capacity to supply this amount to the crop would need a capacity in excess of 0.33 in. per day to allow for water losses. The results indicate that systems that can apply 0.20 in. per day, without allowing for water losses, are sufficient to produce sugar beets in western Nebraska without incurring a reduction in yield. (Skogerboe-Colorado State)
W76-12374

FILTER ESPECIALLY INTENDED FOR FILTERING NATURAL WATER FOR THE IRRIGATION OF CULTIVATED FIELDS,
B. L. Legras.
U. S. Patent No. 3,959,140, 6 p, 6 fig, 11 ref; Official Gazette of the United States Patent Office Vol 946, No 4, p 1741, May 25, 1976.

Descriptors: *Patents, +Irrigation, *Irrigation practices, *Filtration, *Irrigation efficiency, Application equipment, Water delivery, *Filters, Screens, Water quality control.

A cleansable filter intended for filtering natural water for the irrigation of cultivated fields is described. The filter comprises a cylindrical body a filtering element mounted inside the body and defining in the interior two concentric chambers one communicating with the exterior through a drainage valve, and also through one of two lateral openings in the body. The other annular chamber encloses the first chamber and connects with the exterior through the other lateral opening. The filter also has a brush mounted coaxially in the first chamber. The brush rotates manually or automatically to remove all foreign bodies from the inner wall of the first chamber. Water enters the annular chamber through a lateral opening, passes into the first cylindrical chamber and through the filtering elements from the interior to the exterior and leaves by the second lateral opening. Foreign matter can be evacuated by opening the drainage valve. Alternatively, the brush may be driven by a device responsive to the pressure difference between the two chambers, the drainage valve being automatically opened at the same time. (Sinha - OEIS)
W76-12400

OPTIMIZATION OF DESIGN CAPACITY OF AN AQUEDUCT,
California Univ., Berkeley. Lawrence Berkeley Lab.
For primary bibliographic entry see Field 4A.
W76-12526

UNIV. OF ILL. URBANA-CHAMPAIGN

ESIAN APPROACH TO TILE DRAIN IGN,
e Polytechnique Federale de Lausanne tzerland). Dept. of Agriculture.
primary bibliographic entry see Field 8B.
-12527

IAGEMENT OF WATER RESOURCES ER DIFFERENT SOCIO-ECONOMIC CON-ONS,
ona Univ., Tucson.
rimary bibliographic entry see Field 6B.
12626

VATER QUANTITY IANAGEMENT AND ONTROL

Control Of Water On The urface

MIZATION OF REAL TIME DAILY ATION OF A MULTIPLE RESERVOIR EM,
rnia Univ., Los Angeles. Dept. of Engineer-stems.
-G. Yeh.
able from the National Technical Informa-ervice, Springfield, VA 22161 as PB-257 515, in paper copy, $3.00 in microfiche. Report CLA-ENG-7628, April 1976. 167 p, 3 fig, 16 ref, 1 append. OWRT C-5184(4208)(4).

iptors: *Reservoir operation, Hydroelectric , *Optimization, *Linear programming, mic programming, Systems analysis, nflow forecasting, Operations research, rnia, *Multiple-purpose reservoirs, ion making.
iers: *California Central Valley Project, me decision making.

tical optimization model was developed for imal real time daily operation of the Californtral Valley Project (CVP). The CVP water wer facilities considered in the study in-9 storage or regulating reservoirs or ys, 7 powerplants, 3 pumping plants and 2 es which can be used either for power tion or pumpback operations. The CVP per-a number of water resource management ac- which include irrigation, hydroelectric generation, flood control, fish and wildlife ement, navigation, recreation, and water control. An iterative linear programming was developed for the determination of op-ily releases through the CVP facilities. The ve function used was the minimization of of stored potential energy in the system he cost coefficients associated with the programming formulation are related to generation characteristics and reservoir werplant configuration. A dynamic pro-ng algorithm was also developed which im-e linear programming solutions for an optimization. The model developed is nplemented for on-line use to assist the nagers in their daily decision making.
155

ING THE LOCATION AND CAPACITY OD CONTROL STRUCTURES,
Univ., Ithaca, N. Y. Coll. of Engineering.
all, W. F. Bialas, and D. P. Loucks.
le from the National Technical Informa-vice, Springfield, VA 22161 as PB-257 480, paper copy, $3.00 in microfiche. Technical No. 101, Water Resources and Marine Center, Cornell University, Ithaca, New ne 1976. 98 p, 3 fig, 2 tab, 9 ref, append. C-5240 (4230)(3).

Descriptors: *Water resources, *Flood control, *Flood routing, *Planning, *Cost analysis, Optimization, Flood peak, Flood plains, Storage, River basins, Methodology, Equations, Systems analysis, Mathematical models, Evaluation, Design.
Identifiers: *Cost effectiveness, Branch and bound backtracking routine, *Muskingum flood routing procedure.

The Muskingum flood routing procedure together with a branch and bound backtracking optimization routine are used to evaluate alternative capacities and locations of various flood control structures required to protect a flood plain from a specified design flood. This paper describes this preliminary planning procedure and illustrates its use for estimating cost-effective combinations of flood storage capacities in reservoirs, temporary flood storage basin capacities, levee locations and heights, and increased channel capacities in river basin systems. Computational efficiency is necessary if the procedure is to be used many times to estimate the costs required to protect various regions in the flood plain from various design floods and to determine the required accuracy of various economic, hydrologic and design parameters for use in more detailed planning studies. The model developed can be extended to include a distribution of floods rather than a single design flood. This would permit an estimation of the cost of simultaneously providing different levels of flood protection to different regions in the flood plain. (Bell-Cornell)
W76-12156

REVEGETATING DEVASTATED SITES IN NEW MEXICO WITH WESTERN WHEATGRASS TRANSPLANTS,
Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colo.
For primary bibliographic entry see Field 4C.
W76-12161

A STUDY OF THE UTILIZATION OF ERTS-1 DATA FROM THE WABASH RIVER BASIN,
Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
For primary bibliographic entry see Field 7B.
W76-12183

FLOOD DAMAGE REDUCTION POTENTIAL OF RIVER FORECAST SERVICES IN THE CONNECTICUT RIVER BASIN,
National Weather Service, Silver Spring, Md. Office of Hydrology.
H. J. Day, and K. K. Lee.
NOAA Technical Memorandum NWS HYDRO-28, February 1976. 52 p, 16 fig, 9 tab, 11 ref.

Descriptors: *Connecticut, *Vermont, *Massachusetts, Connecticut River, *Flood damage, *River forecasting, Hydrologic data, Flood plains, Warning systems, Classification, Cost-benefit ratio, Topography mapping, Flood protection.
Identifiers: *Flood damage reduction potential, *River forecast services, *Connecticut River basin, Flood plain management, Reducible damage, Flood damage centers, Topographic data collection.

Four carefully selected communities in the Connecticut River Basin were studied for flood damage reduction. Properties on the flood plain were classified into residential, commercial, industrial and automobile categories. Stage damage assessments were made for those categories for four situations: no warning, limited warning time, maximum practical evacuation, and floodproofing of one-story houses. The investigation found that approximately $750,000 of reducible damages could be expected on commercial and residential elements of the flood plain. Industrial structures were classed in the same order of magnitude as residential and commercial structures. Total basinwide reducible damages exceeded $1,500,000 per year. The 1976 cost of the National Weather Service for providing river forecasts throughout the basin was approximately $75,000. It was estimated that a total of $200,000 per year was adequate to provide forecast services associated with reducible damages. (Roberts - ISWS)
W76-12186

SUPERCRITICAL FLOW AT OPEN-CHANNEL JUNCTIONS; HYDRAULIC MODEL INVESTIGATION,
Army Engineer District, Los Angeles, Calif.
For primary bibliographic entry see Field 8B.
W76-12187

EFFECT OF SEEPAGE ON EMBANKMENT DEFORMATIONS DUE TO WATER LOADING,
Sydney Univ. (Australia). School of Civil Engineering.
J. P. Carter, H. G. Poulos, and J. R. Booker.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-242 450, $3.50 in paper copy, $3.00 in microfiche. Research Report No. R256, December 1974. 18 p, 7 fig, 1 tab, 7 ref.

Descriptors: *Embankments, *Earth dams, *Seepage, *Deformation, Soil water, Soil water movement, Drainage, Drainage practices, Soil stability, Soil stabilization, Soil mechanics, *Finite element analysis, Membranes, Mathematical studies, Impervious membranes, Dams, Pore pressure, Movement.
Identifiers: *Embankment deformations, Drainage blanket, Homogeneous dam.

A finite element analysis was made of the movements in an embankment due to water loading, taking account of seepage through the embankment. The effects on deformations of drainage within the embankment and of a central core were investigated for an embankment resting on a rigid base. It was found that the long-term deformations due to water loading may be considerably affected by the pattern of steady state flow, and hence by the provision of drainage within the embankment. Larger horizontal movements were developed when seepage occurred than if an impermeable membrane existed on the upstream face. The modulus of the core relative to the shells also had a significant effect on movements. (Sims - ISWS)
W76-12188

SOME ASPECTS OF STOCHASTIC RESERVOIR THEORY,
Monash Univ., Clayton (Australia).
R. M. Phatarfod.
Journal of Hydrology, Vol. 30, No. 3, p 199-217, July 1976. 5 tab, 18 ref.

Descriptors: *Stochastic processes, *Reservoirs, *Mathematical models, *Simulation analysis, Draft-storage curves, Probability, Inflow, Statistical models, Statistics.
Identifiers: *Stochastic reservoir theory, Draft relationship, Simulation techniques, Gamma Markov sequences, Random-walk techniques, Reservoir size, Inflow distribution, Constant draft ratio.

The problem of the reservoir size-reliability-draft relationship is examined. It compared the mathematician's analytical efforts with the simulation techniques of the engineers and hydrologists and suggested that the two methods should complement each other. The various models for generating gamma Markov sequences were looked at, and a new model which was analytically more suitable to the problem in question was suggested. An alternative to the traditional formulation of the problem in terms of probability of failure was suggested, and a method based on random-walk techniques was employed to give close approximations. The effects of various parameters of the in-

flow distribution on the reservoir size to give the same reliability for a constant draft ratio were discussed. (Roberts - ISWS)
W76-12197

DISCHARGE PREDICTION, PRESENT AND FORMER, FROM CHANNEL DIMENSIONS,
Wisconsin Univ., Madison. Dept. of Geography.
For primary bibliographic entry see Field 2E.
W76-12198

SEA LEVEL COMPUTATIONS OF THE BALTIC WITH A 20-CANAL MODEL,
Fishery Board of Sweden, Goteborg. Hydrographic Dept.
For primary bibliographic entry see Field 2L.
W76-12205

REFORM OF ILLINOIS WATER RESOURCE LAWS WITH PARTICULAR REFERENCE TO THE DRAINAGE CODE AND CLOSELY RELATED LAWS,
Illinois Univ. at Urbana-Champaign. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6E.
W76-12217

WABASH RIVER SYSTEMS MODEL - TERMINAL REPORT PHASE I,
Purdue Univ., Lafayette, Ind. School of Civil Engineering.
G. H. Toebes, C. Rukvichae, and T. A. Sullivan.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 489, $5.00 in paper copy, $3.00 in microfiche. Purdue University Water Resources Research Center, Technical Report No. 76, July 1976. 90 p, 12 fig, 4 tab, 6 append. OWRT A-026-IND(5).

Descriptors: *Reservoir operation, Management, *Reservoir releases, Recreation, Flow control, Flow augmentation, Flood control, Reservoir stages, Reservoir storage, Multiple purpose reservoirs, Simulation analysis, Model studies, *Indiana.
Identifiers: *Reservoir operating policy, Routing models, *Wabash River systems model.

A daily simulation model is presented for the Upper Wabash River and Reservoir System in Indiana. The motivation for this work was to apply systems approaches to surface water planning and management facets for a major river in the state of Indiana. The core of the project was the building of river-reservoir simulation software including reservoir operating policy rules and to do so for a 24 hour time step. The construction of the simulation model, the different operating policies used, a discussion of benefit estimation, and the software documentation have been detailed in five previous reports. (See also W74-12197; W74-12196; W73-07815; W73-04628 and W72-13301) This report contains a brief summary of the materials found in the earlier publications; however its major purpose is to record some over-all conclusions. Presented are views for future research and the benefits that may be derived from this work. Additional work on programs, particularly on data base organization, access, editing and documentation, is given.
W76-12220

A STUDY OF THE EFFECTS OF STREAM CHANNELIZATION AND BANK STABILIZATION ON WARM WATER SPORT FISH IN IOWA: SUBPROJECT I INVENTORY OF MAJOR STREAM ALTERATIONS IN IOWA,
Iowa Cooperative Fishery Unit, Ames.
For primary bibliographic entry see Field 4C.
W76-12234

WATER PRODUCTION FUNCTIONS AND PREDICTED IRRIGATION PROGRAMS FOR PRINCIPAL CROPS AS REQUIRED FOR WATER RESOURCES PLANNING AND INCREASED WATER USE EFFICIENCY,
California Univ., Davis. Dept. of Water Science and Engineering.
For primary bibliographic entry see Field 3F.
W76-12236

SHADOW LENGTH TABLES FOR ENVIRONMENTAL PLANNING,
Forest Service (USDA), Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station.
H. G. Halverson, and J. L. Smith.
Report PSW-102, 1974. 6 p, 2 tab.

Descriptors: Snow management, Planning, Solar radiation, Water management(Applied), Heat, Light, Insolation, Reproduction, *Forest management, Light intensity.
Identifiers: Shadow length tables, Solar light, Solar heat.

Presented are the rationale for using shadows in environmental control; calculation techniques for specific latitudes, dates, aspects and slopes; instructions on using shadow length in planning; and examples of the application of the tables to snowmelt management. Separately, eight sets of tables are available for latitudes 36 degrees north to 50 degrees north in increments of 2 degrees. Each set covers one latitude, 25 aspects, and seven dates during the year. Aspect refers to a dual-angle method of description that includes both slope and aspect. Dates range from December 22, the shortest day of the year, to June 22, the longest. (Forest Service)
W76-12240

CONTROLLING SOLAR LIGHT AND HEAT IN A FOREST BY MANAGING SHADOW SOURCES,
Forest Service (USDA), Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station.
Halverson, G. Howard, and James L. Smith.
USDA Forest Service Research Paper PSW-102, 1974. 14 p, 5 fig, 7 ref.

Descriptors: *Forest management, Light, Heat, Insolation, Data collections, Plant growth, Reproduction, *Light intensity, *Solar radiation, Snow management, Planning.
Identifiers: *Solar light, *Solar heat, Shadows, Sunlight.

Control of solar light and heat to develop the proper growth environment is a desirable goal in forest management. The amount of sunlight and heat reaching the surface is affected by shadows cast by nearby objects, including trees. In timbered areas, the type of forest management practiced can help develop desired microclimates. The results depend on the size and orientation of openings created and on the shade cast by surrounding vegetation. A computerized method to calculate the extent of boundary shading for any combination of date, slope, and aspect between 23.45 degrees N. latitude and 50 degrees N. latitude is described. Shadow-length tables provide coverage for the contiguous United States in increments of 2 degrees from 36 degrees N latitude to 50 degrees N latitude. By extrapolation, the tables can be used from the Mexican to the Canadian border. (Forest Service)
W76-12241

SHADOW LENGTH TABLES FOR LATITUDE 42 DEGREES NORTH,
Forest Service (USDA), Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station.
H. G. Halverson, and J. L. Smith.
Forest Service-PSW-102, 1974. 49 p, 175 tab.

Descriptors: Snow management, Planning, Water management(Applight), Light, *Data collections, *Forest management, Reproduction, Insolation, Solar radiation.
Identifiers: *Shadow length tables.

A set of tables for latitude 42 degrees north, covers, 25 aspects, and seven dates during the year. Aspect refers to a dual-angle method of description that includes both slope and aspect. Dates range from December 22 to June 22. (Forest Service)
W76-12242

SHADOW LENGTH TABLES FOR LATITUDE 50 DEGREES NORTH,
Forest Service (USDA), Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station.
H. G. Halverson, and J. L. Smith.
Forest Service-PSW-102, 1974. 49 p, 175 tab.

Descriptors: Snow management, Planning, Water management(Applied), Light, Reproduction, Insolation, Solar radiation, *Latitudinal studies, *Data collections, *Forest management.
Identifiers: *Shadow lengh tables.

A set of tables for latitude 50 degrees north, covers, 25 aspects, and seven dates during the year. Aspect refers to a dual-angle method of description that includes both slope and aspect. Dates range from December 22 to June 22. (Forest Service)
W76-12243

SHADOW LENGTH TABLES FOR LATITUDE 44 DEGREES NORTH,
Forest Service (USDA), Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station.
H. G. Halverson, and J. L. Smith.
Forest Service-PSW-102, 1974. 49 p, 175 tab.

Descriptors: Snow management, Planning, Water management(Applied), Light, Insolation, Reproduction, Solar radiation, *Forest management, *Data collections, *Latitudinal studies.
Identifiers: *Shadow length tables.

A set of tables for latitude 44 north, covers 25 aspects, and seven dates during the year. Aspect refers to a dual-angle method of description that includes both slope and aspect. Dates range from December 22 to June 22. (Forest Service)
W76-12244

SHADOW LENGTH TABLES FOR LATITUDE 46 DEGREES NORTH,
Forest Service (USDA), Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station.
H. G. Halverson, and J. L. Smith.
Forest Service-PSW-102, 1974. 49 p, 175 tab.

Descriptors: Snow management, Planning, Water managemant(Applied), Light, Insolation, Solar radiation, Reproduction, *Forest management, *Data collections, *Latitudinal studies.
Identifiers: *Shadow length tables.

A set of tables for latitude 46 degrees north covers 25 aspects, and seven dates during the year. Aspect refers to a dual-angle method of description that includes both slope and aspect. Dates range from December 22 to June 22. (Forest Service)
W76-12245

SHADOW LENGTH TABLES FOR LATITUDE 48 DEGREES NORTH,
Forest Service (USDA), Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station.
H. G. Halverson, and J. L. Smith.
Forest Service-PSW-102, 1974. 49 p, 175 tab.

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agement(Applied), Light, Reproduction, Solar
tion, Insolation, *Forest management, *Data
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ifiers: *Shadow length tables.

t of tables for latitude 48 degrees north,
rs 25 aspects, and seven dates during the year.
ct refers to a dual-angle method of descrip-
that includes both slope and aspect. Dates
from December 22 to June 22. (Forest Ser-

12246

OW LENGTH TABLES FOR LATITUDE
GREES NORTH,
t Service (USDA), Berkeley, Calif. Pacific
west Forest and Range Experiment Station.
Halverson, and J. L. Smith.
t Service-PSW-102, 1974. 49 p, 175 tab.

iptors: Snow management, Planning, Water
gement(Applied), Light, Insolation,
duction, Solar radiation, *Forest manage-
*Data collections, *Latitudinal studies.
fiers: *Shadow length tables.

of tables for latitude 38 degrees north covers
pects, and seven dates during the year.
t refers to a dual-angle method of descrip-
hat includes both slope and aspect. Dates
from December 22 to June 22. (Forest Ser-

2247

OW LENGTH TABLES FOR LATITUDE
GREES NORTH,
Service (USDA), Berkeley, Calif. Pacific
vest Forest and Range Experiment Station.
Halverson, and J. L. Smith.
Service-PSW-102, 1974. 49 p, 175 tab.

ptors: Snow management, Planning, Water
ement(Applied), Light, Insolation,
duction, Solar radiation, *Data collections,
t management, *Latitudinal studies.
iers: *Shadow length tables.

f tables for latitude 40 degrees north covers
ects, and seven dates during the year.
refers to a dual-angle method of descrip-
at includes both slope and aspect. Dates
rom December 22 to June 22. (Forest Ser-

248

W LENGTH TABLES FOR LATITUDE
REES NORTH,
Service (USDA), Berkeley, Calif. Pacific
est Forest and Range Experiment Station.
alverson, and J. L. Smith.
Service-PSW-102, 1974. 49 p, 175 tab.

tors: Snow management, Planning, Water
ment(Applied), Light. Insolation,
uction, Solar radiation, *Data collections,
management, Latitudinal studies.
ers: *Shadow length tables.

tables for latitude 36 degrees north covers
ts and seven dates during the year. Aspect
a dual-angle method of description that
both slope and aspect. Dates range from
er 22 to June 22. (Forest Service)
49

AL SIMULATION OF STREAMFLOW

Carolina State Univ., Raleigh. Dept. of
al and Agricultural Engineering.
ary bibliographic entry see Field 2A.
50

SURFACE WATER AVAILABILITY, PICKENS COUNTY, ALABAMA,
Geological Survey, Tuscaloosa, Ala.
M. E. Davis, and A. L. Knight.
Alabama Geological Survey, University, Map 126, 1972. 9 p, 3 fig, 1 map, 1 tab, 11 ref.

Descriptors: *Surface water availability, *Streamflow, *Water yield, *Water quality, Chemical analysis, Runoff, Average flow, Low flow, Hydrologic data, Maps.
Identifiers: Pickens County(Ala).

The average annual runoff originating in Pickens County, Alabama, is about 18 inches or 0.84 million gallons per day (mgd) per square mile. The Tombigbee and Sipsey Rivers, where they join, have average flows of about 5,600 mgd and 700 mgd, respectively, and median annual 7-day low flows in excess of 350 mgd and 45 mgd, respectively. Lubbub, Bear, and Coal Fire Creeks have average flows that exceed 100 mgd at their mouths and median annual 7-day low flows of 9 mgd or greater in their lower reaches. The dissolved-solids content of surface water (estimated from specific conductance values) is less than 50 mg/liter except in the Tombigbee River where the dissolved-solids content generally is less than 75 mg/liter. The water is soft and the chloride content generally is less than 10 mg/liter. (Woodard-USGS)
W76-12280

WATER AVAILABILITY OF MONROE COUNTY, ALABAMA,
Geological Survey, Tuscaloosa, Ala.
J. C. Scott, M. E. Davis, J. F. McCain, and H. M. Whitman.
Alabama Geological Survey, University, Map 132, 1972. 30 p, 5 fig, 2 maps, 5 tab, 16 ref.

Descriptors: *Water resources, *Available water, *Surface waters, *Groundwater, *Water quality, Water supply, Water utilization, Water yield, Streamflow, Flow rates, Aquifer characteristics, Hydrologic budget, Maps.
Identifiers: Monroe County(Ala).

The principal sources of ground water presently being utilized in Monroe County, Alabama, are the Nanafalia aquifer in the northern and central parts of the county and the Miocene-Pliocene aquifer in the southern part. These aquifers are capable of yielding from 0.2 to 1.0 million gallons per day (mgd) or more per well. Potential sources of ground water not presently being utilized are the Ripley aquifer in the northeastern part of the county and the Eocene-Oligocene aquifer in the southern part. These aquifers are capable of yielding as much as 1.0 mgd per well. An average of about 315 mgd of water is recharged to groundwater reservoirs in the county annually. The Alabama River, the largest source of surface water, has an average flow of about 20,500 mgd and a 7-day low flow of about 5,750 mgd at Claiborne. The Little River and Big Escambia, Lovetts, Randons, Limestone, and Big Flat Creeks are also potential sources of large quantities of water. These streams have average flowsin excess of 50 mgd and 7-day low flows in excess of 2 mgd in their lower reaches. Average runoff into streams in the county is about 0.95 mgd per square mile of drainage area. Ground water generally is soft but the dissolved-solids content exceeds 1,000 mg/liter in some parts of the county, and locally the iron content exceeds 0.3 mg/liter. Surface water is soft and generally contains less than 100 mg/liter dissolved solids. Water use in 1967 in Monroe County was about 2.8 mgd, which is less than 1 percent of the total water available. (Woodard-USGS)
W76-12281

GUIDE TO THE AVAILABILITY OF HYDROLOGIC DATA, GREATER PITTSBURGH REGION, PENNSYLVANIA.
Geological Survey, Harrisburg, Pa.
For primary bibliographic entry see Field 7C.
W76-12282

GEOLOGY AND WATER RESOURCES OF BROWN COUNTY, SOUTH DAKOTA--PART II: WATER RESOURCES,
Geological Survey, Huron, S. Dak.
N. C. Koch, and W. Bradford.
South Dakota Geological Survey, Vermillion, Bulletin 25, 1976. 53 p, 29 fig, 6 tab, 24 ref, append.

Descriptors: *Water resources, *Water quality, *Aquifer characteristics, *Surface waters, *South Dakota, Water wells, Water yield, Water utilization, Water level fluctuations, Streamflow, Flow rates, Floods, Groundwater recharge, Chemical analysis, Water analysis, Hydrogeology.
Identifiers: Brown County(S Dak).

Brown County, an agricultural County in northeastern South Dakota, has an area of 1,683 sq mi. Glacial outwash is an important water-bearing deposit in Brown County. Such deposits contain three major aquifers, the Deep James, Middle James, and Elm. Where 40 ft or more thick, these aquifers can provide yields of 500 gpm or more. The quality of water from aquifers above the bedrock surface varies from good to very poor for irrigation use. Recharge to these glacial drift aquifers is by infiltration and percolation of snowmelt and precipitation through overlying materials and by subsurface inflow from Spink and Marshall Counties. The major bedrock aquifers thus far developed are in the Dakota, Fall River, and Sundance Formations. Wells tapping these aquifers are from 850 to 1,450 ft deep. Water from the Sundance aquifer recharges the Fall River aquifer which in turn recharges the Dakota aquifer. The chemical quality of water from the Dakota, Fall River, and Sundance aquifers varies from fair to poor. Most streamflow, and any flooding, in Brown County occurs in the spring and early summer from snowmelt and precipitation. Except for the Elm River, most streams commonly have no flow in the late summer, fall, and winter. The James River between Columbia and Stratford loses water at an average rate of 3,000 acre-ft per year by evaporation. During major flooding from 1950 to 1970 five periods of major stream loss occurred, ranging from 16,000 to 40,000 acre-ft. The dissolved solids concentration of water from streams during periods of high flow may be less than 300 mg/liter, but during periods of low flow it may be more than 2,000 mg/liter. (Woodard-USGS)
W76-12290

FLOOD DISCHARGE OF STREAMS IN NEW MEXICO AS RELATED TO CHANNEL GEOMETRY,
Geological Survey, Albuquerque, N. Mex.
For primary bibliographic entry see Field 2E.
W76-12294

RESPONSE OF WATER-HYACINTH TO LASER RADIATION,
Oral Roberts Univ., Tulsa, Okla. Dept. of Natural Sciences.
R. Couch, and E. O. Gangstad.
Weed Sci. 22(5), p 450-453, 1974.

Descriptors: *Water hyacinth, *Radiation, Leaves, Photosynthesis, Growth rates, Plant growth, Translocation, *Aquatic weed control.
Identifiers: Eichhornia-Crassipes, *Laser radiation.

Waterhyacinth (Eichhornia crassipes (Mart.(Solms.) was partially controlled with 10.6 nm laser radiation. Radition levels of < 1 J/cm2 for individually irradiated plants and 69 J/cm2 for group-irradiated plants significantly inhibited growth. Photosynthesis in treated plant-leaf tissue was inhibited about 50% by an exposure level of 4 J/cm2. 14C-labeled compounds fixed by plantleaf tissue following laser treatment were found to be

normally distributed.--Copyright 1974, Biological Abstracts, Inc.
W76-12406

ALLOWANCE FOR THE STOCHASTIC CHARACTER OF HYDROLOGICAL DATA IN WATER PROJECT DECISIONS,
National Water Authority, Budapest (Hungary). Engineering Secretariat.
For primary bibliographic entry see Field 7A.
W76-12439

A SNOWMELT RUNOFF MODEL AND ITS APPLICATION TO SHORT-RANGE FORECASTING OF FLOOD DISCHARGES,
Hydrometeorological Service of the USSR, Moscow.
For primary bibliographic entry see Field 2C.
W76-12440

REMOTE SENSING OF MISSISSIPPI RIVER CHARACTERISTICS,
Colorado State Univ., Fort Collins, Dept. of Civil Engineering.
For primary bibliographic entry see Field 7B.
W76-12442

EVALUATION OF PAVEMENT DRAINAGE SYSTEMS MADE OF LAYERS OF OPEN-GRADED BITUMINOUS AGGREGATE MIXTURES,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8F.
W76-12456

IMPACT OF HURRICANE TIDAL SURGES ON SUBSEQUENT LAND USE CHANGES AND WATER RESOURCES REALLOCATION,
University of Southern Mississippi, Hattiesburg. Dept. of Geography and Area Development.
R. D. Cross.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 840, $4.50 in paper copy, $3.00 in microfiche. Mississippi Water Resources Research Institute, Mississippi State, Completion Report, July 1976. 54 p, 5 fig, 11 tab, 10 ref. OWRT A-095-MISS(1).

Descriptors: Water distribution(Applied), *Hurricanes, *Surges, *Land use, Tidal waters, Tidal effects, Gulf of Mexico, *Mississippi, Coasts, Gulf Coastal Plain, Water demand, Water quality.
Identifiers: *Hurricane Camille(1969), Water resources reallocation, *Tidal surges.

The purpose was to assess the impact of the tidal surge of Hurricane Camille on the land use changes on the Gulf Coast of Mississippi and to determine the water resources reallocations. Single-family residences least likely to regenerate in the coastal part of the surge zone, but residential property was the fastest growing land use further inland in the surge zone. Land use for commercial establishments, which are transportation oriented, was most likely in the most storm-prone part of the surge zone. Increasing population densities in the surge zone and the growth of industry were major factors increasing the water demand and contributing to deteriorating water quality.
W76-12461

SATELLITE SNOW OBSERVATIONS AND SEASONAL STREAMFLOW FORECASTS,
National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center.
For primary bibliographic entry see Field 2C.
W76-12468

WINDBREAKS MAY INCREASE WATER YIELD FROM THE GRASSLAND ISLANDS IN ARIZONA'S MIXED CONIFER FORESTS,
Forest Service (USDA), Tempe, Ariz. Forest Hydrology Lab.; and Forest Service (USDA), Tempe, Ariz. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 3B.
W76-12477

ECONOMIC UNCERTAINTIES IN WATER RESOURCES PROJECT DESIGN,
Eotovs Lorand Univ., Budapest(Hungary).
For primary bibliographic entry see Field 6A.
W76-12514

A DYNAMIC REGIONAL MODEL FOR EVALUATING RESOURCE DEVELOPMENT PROGRAMS,
Manitoba Univ., Winnipeg. Dept. of Agricultural Economics.
F-L. Tung, J. A. MacMillan, and C. F. Framingham.
American Journal of Agricultural Economics, Vol. 58, No. 3, p 403-414, August 1976. 1 fig, 3 tab, 34 ref.

Descriptors: *Resources development, Economics, *Simulation analysis, Evaluation, *Regional analysis, Drainage, Water, Land clearing, Income distribution, Effects, Governments, Mathematical models, Equations, Systems analysis, *Canada.
Identifiers: Development programs, *Interlake Area(Manitoba).

The usefulness of a dynamic regional economic model for evaluating resource development programs is described and demonstrated. The model results indicate that without development programs, land may constrain livestock production after 1976. The growth in crop production is demand determined and will not exceed available land. A labor requirement of 15,400 man-years is projected for 1976 with 2,600 unutilized. Output and income distribution effects of drainage, training, and land-clearing development programs are assessed for the Interlake Area of Manitoba. (Bell-Cornell)
W76-12520

WATER YIELD MODEL USING SCS CURVE NUMBERS,
Agricultural Research Service, Temple, Tex.
For primary bibliographic entry see Field 2A.
W76-12522

STRUCTURAL MODEL STUDIES FOR THE HENDRIK VERWOERD DAM,
Wimpey (George) and Co. Ltd., Hayes (England). Wimpey Central Lab.
For primary bibliographic entry see Field 8A.
W76-12523

OPTIMIZATION OF DESIGN CAPACITY OF AN AQUEDUCT,
California Univ., Berkeley. Lawrence Berkeley Lab.
J. Sathaye, and W. A. Hall.
Journal of the Irrigation and Drainage Division, Proceedings of the American Society of Civil Engineers, Vol 102, No IR3, p 295-305, September 1976. 3 tab, 1 fig, 11 ref.

Descriptors: *Aqueducts, *Irrigation, *Optimization, *Mathematical models, Design, Planning, Water allocation(Policy), Dynamic programming, Constraints, Methodology, Equations, Systems analysis.
Identifiers: Benefit maximization, Demand functions, Computer programs, Design capacity.

A methodology is presented for determining th proper allocation of water to the various co sumers along an aqueduct under varying dema conditions such that the net benefit obtained maximum. With these allocations, the aqueduc capacity required between diversions is dete mined. The methods are highly suitable for o timum analysis in development planning situ tions. Two deterministic analytical models usi dynamic programming are presented. The fi model considers the problem with simultaneous peaking demand functions; the second mod removes this constraint from the demand fun tions. The results provide the optimum sizes of t aqueduct reaches for a given quantity of availab water. (Bell-Cornell)
W76-12526

BAYESIAN APPROACH TO TILE DRA DESIGN,
Ecole Polytechnique Federale de Lausan (Switzerland). Dept. of Agriculture.
For primary bibliographic entry see Field 8B.
W76-12527

FLOOD-HAZARD EFFECTS ON RESIDENTIA PROPERTY VALUES,
Virginia Polytechnic Inst. and State Uni Blacksburg. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6G.
W76-12529

A LEGAL-HISTORICAL ANALYSIS NAVIGATION USER CHARGES,
Department of Environment, Ottawa (Ontario).
For primary bibliographic entry see Field 6E.
W76-12532

EVALUATING TISZA RIVER BAS DEVELOPMENT PLANS USING MULTIA TRIBUTE UTILITY THEORY,
International Inst. for Applied Systems Analy Laxenburg (Austria).
R. L. Keeney, E. F. Wood, L. David, and K. Csontos.
Collaborative Publication report, CP-76-3, Int national Institute for Applied Systems Analy Laxenburg, Austria, March 1976. 24 p, 5 fig, 4 t 17 ref.

Descriptors: *Water resources developme *River basins, *Alternative planning, *Decis making, Optimum development plans, Long-ra planning, Evaluation, Equations, Assessme Inter-basin transfers, Reservoirs, Mathemat models, Systems analysis, Risks.
Identifiers: *Tisza River basin(Hungary), *Uti function, *Multiple objectives, Scaling factors.

Choosing among several development plans the water resources of the Tisza River in Hung is a complex problem, due to the multiple conf ing objectives, i.e., economic, environmental, cial and technical considerations. This paper vestigates the usefulness of multiattribute uti theory for evaluating alternative plans for w resources development in the Tisza basin. result, which requires an explicit consideratio the tradeoffs among attributes, is a card evaluation of the alternatives. This indicates much better one alternative is than another as as permits a sensitivity analysis of the tradeo Also, the model is appropriate for explicitly cluding in a rigorous manner the uncertaintie the problem in the formal analysis. Five poss planning alternatives are described; next, tw attributes that measure the degree to which planning objectives are met are defined. A ut function over the twelve attributes is assessed preliminary results indicate that building i basin water transfers from the Danube or f small reservoirs in the northeast is to be prefe to developing the other three alternatives sidered. (Bell-Cornell)
W76-12534

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USE OF COMPUTER TECHNIQUES AND OMATION FOR WATER RESOURCES TEMS.
omic Commission for Europe (UN), New . Committee on Water Problems, Economic Social Council.
rimary bibliographic entry see Field 6A.
-12535

FESSIONAL REQUIREMENTS OF ERN WATER ENGINEERS INVOLVED IN R BASIN MANAGEMENT UTILIZING TEMPORARY TOOLS,
au of Reclamation, Sacramento, Calif. Mid- ic Regional Office.
Hammond.
he Use of Computer Techniques and Auto- n for Water Resources Systems, Washing- .C., 1974, Volume II. p 7-10.

iptors: *River basins, *Management, En- ring, Decision making, Evaluation, Dynamic amming, Operations, Water policy, Water rces development, Planning, Mathematical s, *California.
fiers: Central Valley Project(Cal).

erating demands on the world's limited water rces forces the water engineer to recognize ed for the avant garde professional, the in- al who is able and willing to use modern o assist in making complex and crucial deci- This paper describes a case study within the l Valley Project in California and then nesizes a description of the education, ex- ce, and personality of the professional water er needed for modern river basin manage- Discussed is the use of a state incremental ic programming model to determine optimal ing policy. (See also W76-12535) (Bell-Cor-

2537

NIQUES OF SIMULATION FOR OLOGIC COMPUTATION, IN QUANTI- D QUALITY, OF INTEGRATED WATER URCES DEVELOPMENTS,
de la Recherche Scientifique et Technique Mer, Paris (France). Dept. of Fundamental ch Bureau.
mary bibliographic entry see Field 6A.
539

F SIMULATION MODELS FOR THE ATION OF A REGIONAL WATER- RCE SYSTEM,
Resources Board, Reading (England).
nary bibliographic entry see Field 6A.
540

CATION OF DYNAMIC PROGRAMMING AMING OPERATING RULES FOR A -PURPOSE DAM,
Grenobloise d' Etude et d' Applications iques (France).
nand.
Use of Computer Techniques and Auto- for Water Resources Systems, Washing- ., 1974, Volume II, p 24-27.

ors: *Water resources development, *Multiple-purpose projects, *Dams, Op- n, Economics, Benefits, Costs, Annual, ms, Storage, Decision making, Planning, ers, Operations research, Mathematical

rs: *Operating rules, *Economic produc- tions, Marginal values.

mine the optimal dimensions of a develop- ject, one relies on a cost-benefit analysis. ating the economic benefits one may ex- erive for a development project, one is to tent dependent on the operating rules adopted for the scheme. It is important, therefore, to consider the 'optimal operational strategy' problem from the very start of the feasibility study. To define an optimal operating policy for a multi-purpose development scheme and calculate the mathematical expectanctany of the annual gain hoped for, the storage can be considered as a stock of raw material (water) which yields a short-term economic benefit and which competes with the long-term benefit to be derived from storage designed to meet requirements in future months. In comparing the respective advantages associated with the water supply and storage level, monetary values in the form of economic production functions are taken as the reference. This article considers economic production functions in the determination of marginal storage values, operating rules and average annual operating gain for a multi-purpose dam. The Decision-Hazard type problem to be solved utilizes dynamic programming to find the optimum operating strategy. (See also W76-12535) (Bell-Cornell)
W76-12541

DYNAMIC PROGRAMMING FOR DETERMINATION OF A STORM WATER OUTLET SYSTEM OF PIPES AND FLOOD-DAMPING DAMS,
Societe Grenobloise d'Etude et d' Applications Hydrauliques (France).
M. L. Darnige.
In: The Use of Computer Techniques and Automation for Water Resources Systems, Washington, D. C., 1974, Volume II, p 27-29.

Descriptors: *Water resources development, *Dynamic programming, *Storm water, *Outlets, Pipes, Dams, Flood control, Hydrographs, Storage, Discharge(Water), Opitimization, Metholodology, Upstream, Algorithms, Systems analysis.
Identifiers: *Cost minimization.

This short article considers finding the optimalcost and operation of an arterial catchment area outflow network. The first computation phase ends at the final point downstream, for which the upstream discharge index corresponding to minimal total cost is determined. In the second phase, the required development design discharge for each section and the associated storage capacities at each site are established from the index, working up the arterial system. In considereing the validity of the optimization method, it is commented that the method should be classed as heuristic, providing a solution of 'theoretically non-proven optimality,' which at best be taken only as optimal or near-optimal. (See also W76-12535) (Bell-Cornell)
W76-12542

A QUANTITATIVE MODEL FOR THE PLANNING OF SURFACE WATER RESOURCES: USE OF MIXED VARIABLE LINEAR PROGRAMMING,
Ardour-Garonne Agency, Toulouse (France), Programming Group.
D. Bortolet, R. Lohou, and D. Monges.
In: The use of Computer Techniques and Automation for Water Resources Systems, Washington, D.C., 1974, Vol. II, p 43-48. 4 fig.

Descriptors: *Water resources, *Planning, *Surface waters, *Linear programming, *River basins, Computers, *Computer programs, Algorithms, Reservoirs, Demand, Storage, Construction, Scheduling, Constraints, Mathematical models, Systems analysis.

Presented is a linear programming model for dealing with the problem of keeping a minimum acceptable flow in a river basin in spite of irrigation. The actual problem to solve is the scheduling of the construction of reservoirs to satisfy irrigation demand with a given guarantee without river flows falling under the minimum acceptable flow and with a view to keeping the updated cost of the computer program to a minimum. In the methodology, first a demand and an offer curve are derived. Then, to linearize the program, the curves are cut into segments giving the cost function of capacity. A double micro-decomposed structure is derived which is used largely to minimize the occupied computer's store. The Branch and Bound algorithm is used to solve the mathematical programming problem. (See also W76-12535) (Bell-Cornell)
W76-12546

EXPERIENCES WITH MATHEMATICAL MODELS USED FOR WATER QUALITY AND QUANTITY PROBLEMS,
Rijkswaterstaat, The Hague(Netherlands), Data Processing Div.
For primary bibliographic entry see Field 6A.
W76-12548

RIVER SYSTEM MODELLING FOR OPERATIONAL FORECASTING,
National Weather Service, Silver Spring, Md. Hydrologic Research and Development Lab.
E. L. Peck.
In: The Use of Computer Techniques and Automation for Water Resources Systems, Washington, D.C., April 1974, Vol. II, p 91-95. 6 ref.

Descriptors: *River systems, *Forecasting, *Hydrology, *Data processing, Operations research, Mathematical models, Parametric hydrology, Optimization, Computers.
Identifiers: Catchments.

Since the introduction of computers, river forecast offices have initiated methods to automate data collection and processing, forecast preparation, and the distribution of warnings and forecasts. A goal has been set to develop forecast procedures which maximize the usefulness of modern data acquisition and processing techniques and incorporate the use of a conceptual hydrological simulation model. Computer programs and techniques cover all phases of development, including the acquisitation , processing of basic data, the calibration of model parameters, and operational forecasting procedures. This article discusses basic data acquisition and processing, a conceptual catchment model, parameter optimization, future additions, field application, and program availability. (See also W76-12535) (Bell-Cornell)
W76-12550

SYSTEMS SIMULATION AS A TOOL FOR WATER RESOURCE PLANNING, INCLUDING QUALITATIVE ASPECTS,
Bureau of Reclamation, Denver, Colo. Research and Engineering Center.
K. O. Eggleston, J. D. Hendrick, E. A. Cristofano, and A. E. Gibbs.
In: The Use of Computer Techniques and Automation for Water Resources Systems, Washington, D.C., April 1974, Vol. II, p 95-99.

Descriptors: Water resources, *Planning, *Colorado River, *Simulation analysis, *Salinity, Routing, Hydrology, River basins, Computers, Mathematical models, Systems analysis.

In the Colorado River, additional water utilization features are being constructed which will allow the total flow of the river to be diverted for usage. The increasing diversions and consumptive uses are increasing the natural salinity levels. To analyze this problem and to assist in planning salinity alleviation measures, a basin simulation model has been developed. This article discusses the model in terms of general capability and operation, relationships with basin features, hydrological relationships, and salinity routing. This approach allows the operator to interact with the system and utilize his experience and intuition, thereby solving efficiently complex problems pertaining to river basins. (See also W76-12535) (Bell-Cornell)
W76-12551

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MATHEMATICAL SIMULATION AND OPTIMIZATION OF FLOOD CONTROL SYSTEMS,
Belorusskii Central Research Inst. for Water Resources, Minsk.
V. A. Khavitch.
In: The Use of Computer Techniques and Automation for Water Resources Systems, Washington, D.C. April 1974, Vol. II, p 126-129. 1 tab, 6 ref.

Descriptors: *Flood control, *Optimization, *Simulation analysis, Chezy equation, Constraints, Unsteady flow, Decision making, Design, Computers, Mathematical models, Systems analysis.
Identifiers: Cost minimization.

Flood control necessitates development of efficient systems which can provide preventive or operational control. Providing a passive protection from high waters, the former involve measures for building dikes and increasing the channel capacity, or both. The latter have an effect on active flood control and include regulating reservoirs to be filled and emptied depending on the flood flow. This paper discusses problems of applying mathematical simulation methods to optimization of a preventive control system which comprises a regulated channel and dike structures. The optimization procedures serve to determine system structure parameters which minimize annual total costs. In this case, it is appropriate to apply a scanning method which makes provisions for a simple algorithm and a possibility to find a global extreme irrespective of the function type. Model tests show that the optimal decisions may result not from combined channel improvement and dike construction only, but can involve one of these separate measures. (See also W76-12535) (Bell-Cornell)
W76-12554

SIMULATION MODEL OF THE QUANTITATIVE AND QUALITATIVE EVOLUTION OF WATER RESOURCES AT DIFFERENT POINTS OF A RIVER-BASIN (ORNE),
Financial Agency of the Basin 'Seine-Normandie', Paris(France). Water Resources Div.
M. Dargent, and F. Biesel.
In: The Use of Computer Techniques and Automation for Water Resources Systems, Washington, D.C., April 1974, Vol. II, p 129-132.

Descriptors: *Simulation analysis, Water resources, *River basins, *Hydrologic aspects, Management, Forecasting, Computers, Data collections, Meteorology, Economics, Mathematical models.

The hydrological evolution of a large basin is of great physical complexity. The decision maker needs a simulation model which allows him to forecast physical consequences. This article discusses the need for such a management model and for preliminary studies necessary for the quantitative econometric exploitation of the model. The model capable of effecting the needed forecasts with sufficient precision should represent the essential elements of the hydrological cycle--the principal runoff lines of surface water, the flow laws of underground water tables, climatological phenomena, human consumption, discharges, pollution, and so on. The correct resolution of three categories of problems is essential to a quantitative econometric use of the model: (1) mathematical and computer aspects raise technical difficulties now under control; (2) the collection of natural data can be long and costly if one begins with nothing but poses no new technical problem; and (3) the probability quantification of climatic calendars used by the model raised a problem for statistical meteorology in a new way and necessitates studies of particular difficulty. The principal difficulty is not to be found in the new techniques, but in the determination of the conditions of regulation and use of the model. (See also W76-12535) (Bell-Cornell)
W76-12555

THE 'POLPOLE' MODEL: AN ATTEMPT TO ANALYSE THE WATER SYSTEM IN THE FINANCIAL AGENCY OF A FRENCH RIVER BASIN,
Financial Agency of the Basin 'Seine-Normandie', Paris (France).
P. F. Teniere-Buchot.
In: The Use of Computer Techniques and Automation for Water Resources System, Washington, D. C., April 1974, Vol. II, p 133-136.

Descriptors: *River basins, *Long-term planning, *Water resources development, *Water supply, *Water pollution control, Computers, Mathematical models, Simulation analysis, Operations research, Graphical methods, Forecasting.
Identifiers: *Seine-Normandie Basin(France).

Described is France's unique organization of Financial Agents of the Basin, administering the national inheritance in terms of resources and safeguarding quality. Royalties are paid by consumers and refunded to them in the form of subsidies designed to facilitate water resources development and water pollution control. Discussed is an analysis of the Seine-Normandie hydro-geographical Basin to facilitate the choice of long-term objectives by systematically investigating the various potential outcomes regarding water supplies and the increase or decrease in water pollution. The method used is the provisional structural analysis, an overall approach employing matricial procedures, the theory of graphs, and operational research. It is developed in seven phases: (1) inventory of the variables making up the system; (2) creation of a register of logical relations existing between variables; (3) creation of a basic relations register; (4) synthesis of decisional actions and planning; (5) creation of a system associated graph; (6) quantization of the graph; and (7) computer processing. Limited to a single objective, 'progress of pollution,' the Popole model analyses the yearly changes in some fifteen variables. (See also W76-12535) (Bell-Cornell)
W76-12556

THE APPLICATION OF MATHEMATICAL MODELS AND OPTIMIZATION TECHNIQUES IN PLANNING WATER SUPPLY AND WASTE WATER DISPOSAL SYSTEMS,
Michigan Univ., Ann Arbor. Dept. of Environmental and Industrial Health.
For primary bibliographic entry see Field 6A.
W76-12560

ELABORATION AND USE OF A MATHEMATICAL MODEL TO FORECAST IN QUANTITY AND QUALITY, THE WATER DEMANDS OF VARIOUS SECTORS OF INDUSTRY,
Societe du Canal de Provence et d'Amenagement de la Region Provencale Le Tholonet, Aix-en-Provence (France).
For primary bibliographic entry see Field 6D.
W76-12562

OPTIMAL DEVELOPMENT PROGRAMME FOR REGIONAL WATER SUPPLY SYSTEMS,
National Water Authority, Budapest (Hungary).
For primary bibliographic entry see Field 6A.
W76-12563

SIMPLIFIED DECISION MODEL FOR NATIONAL WATER SUPPLY DEVELOPMENT,
National Water Authority, Budapest (Hungary).
For primary bibliographic entry see Field 6A.
W76-12564

CONSTRUCTION AND UTILIZATION OF COMPLEX MATHEMATICAL MODELS IN THE PLANNING OF THE OPTIMAL DEVELOPMENT OF LARGE HYDROGRAPHIC SYSTEMS AND RIVER BASINS,
Ecole Nationle Superieure des Mines de Paris, Fontainebleau(France) Center for Geological Information.
Y. Emsellem, P. Ramain, A. Dreyfus, and P. Hubert.
In: The Use of Computer Techniques and Automation for Water Resources Systems, Washington, D.C., April 1974, Vol. II, p 177-180.

Descriptors: *Water resources development, *River basins, *Planning, Hydraulics, Optimization, Regional analysis, Forecasting, Simulation analysis, Costs, Mathematical models, Systems analysis.

Water is used to satisfy the needs of a set of groups and activities. Based on these needs, the necessary hydraulic projects are estimated and their finances calculated; financial transfers between activities and between groups are analyzed. On the basis of each possible objective set, a synthetic file is built; the comparison between synthetic files is used to clarify the choices. Optimization is difficult on a big scale; at the level of large basins, there is no optimal objective solution: there exists only one solution which is the best from a subjective viewpoint. A set of models and related operations built by the Delegation for Technical and Scientific Research are examined herein. Included are: regional segmentation; development plans; regional description; typology of the users, forecast model; hydraulic systems typology; simulation model; cost repartition model; and transfer analysis. (See also W76-12535) (Bell-Cornell)
W76-12566

FLOOD HAZARD ANALYSES FOR LOWER MARSH CREEK (INCLUDING SELECTED TRIBUTARIES), BANNOCK COUNTY, IDAHO
Soil Conservation Service, Boise, Idaho.
Prepared for Bannock County, Idaho Department of Water Resources, Southeast Idaho Council of Governments, Portneuf Soil and Water Conservation District. July 1975. 28 p, 6 fig, 15 plates, 7 tab

Descriptors: *Floods, *Flood profiles, *Idaho, Floodwater, *Streamflow forecasting, Flood forecasting, Peak discharge, Non-structural alternatives, Zoning, Control structures, Flood plains, Ice jams.
Identifiers: *Marsh Creek(ID), Goodenough Creek(ID), Walker Creek(ID), Birch Creek(ID), Dry CAnyon(ID), Bannock County(ID), Cottonwood Creek(ID), Bell Marsh Creek(ID), Downey(ID), Arimo(ID), 500 year flood, 100 year flood.

Flood plains in the study area are used primarily for agriculture, though there is some residential development which is expected to increase. Population within incorporated areas of Bannock County is about 900. Marsh Creek watershed is about 400 square miles of mountainous terrain. The gradient of Marsh Creek, a tributary of Portneuf River, is about 4.5 feet per mile and the creek has numerous small tributaries. Floods occur in winter and early spring when there is generally a moderate volume of water, the runoff lasts 5 to 7 days and debris and ice are carried by water to plug bridges and culverts. Floods also occur in late spring and summer after thunderstorms. These are generally of short duration with a small volume of runoff. Since 1911, 21 floods of note have occurred. The largest was in 1962. Future floods are predicted through the use of regression analysis to correlate watershed data with data from similar watersheds. For Marsh Creek the following peak flows are predicted for each recurrence interval: 500 year, 2,340 cubic feet per second; 100 year, 1,450 cfs; 50 year, 1,170 cfs; and 10 year, 630 cfs. For Dry Canyon the following figures were computed: 500 year, 4,730 cfs; 100 year, 1,610 cfs; 50 year, 890 cfs; and 10 year, 220 cfs. Along Marsh Creek the areas flooded will vary from 1030 ac

,4890 acres depending on the predicted flow. cific recommendations are made on flood plain Agriculture ctan continue to use flood plains, e industrial, commercial and residential uses ld be restricted and buildings should be flood fed. A combination of zoning codes and other lations can be used to accomplish this. Struc- means may be used in some locations. (Smith th Carolina)
-12580

RKS CREEK FLOOD PLAIN STUDY, AWBA COUNTY, NORTH CAROLINA.
Conservation Service, Raleigh, N. C.
ared for Catawba County, North Carolina, ber 1975. 8 p, 2 fig, 50 plates, 2 append.

riptors: *Floods, *Flood profiles, dways, *Flood plains, *North Carolina, l flow, Flood peak.
ifiers: *Clarks Creek(NC), Catawba Coun- C), Hickory(NC), Newton(NC), en(NC), 10-year flood, 100-year flood.

hazard areas have been identified in towns ickory, Maiden and Newton (NC). In the shed, urban and commercial development s 20 to 25% of the land. Most of the area is nd, pastureland and woodland. Clarks , which drains 65 square miles, is a tributary uth Fork River downstream from the study Located in the central Piedmont area of Carolina, the stream flows through mostly rolling topography in the uplands and rather flat flood plain adjacent to the stream. Nu- s tributaries enter the stream. Since there is eamgage in the area, data from hydrologi- imilar watersheds were used. Water surface s were determined for the 10-year flood, ar flood, and a large magnitude storm (14 infall) exceeding the 100-year flood. Seven- representative cross sections were sur- The 100-year flood was analyzed both with g development conditions and estimated fu- evelopment conditions. Photo strip maps of od plain and flood profiles are included. - North Carolina)
2582

HEASTERN UNITED STATES WATER Y STUDY, INTERIM REPORT, CRITI- HOICES FOR CRITICAL YEARS.
Engineer Div. North Atlantic, New York.
mary bibliographic entry see Field 6D.
2584

D HAZARD ANALYSES REPORT: EAST CH NIMISHILLEN CREEK, STARK TY, OHIO.
nservation Service, Columbus, Ohio.
d for the Ohio Department of Natural ces, (Columbus), and Stark County, Ohio. r 1975. 18 p, 5 fig, 23 plates, 4 tab, 13 ref.

tors: *Floods, *Streamflow forecasting, profiles, *Flood data, Peak discharge, ays, Flood protection, Non-structural al- es, Warning systems, Control structures,

ers: East Branch Nimishillen Creek(OH), unty(OH), 100 year flood, 25 year flood, rface profiles.

unty is characterized by a land use and ic base that is mainly agricultural. Project- nt development rates, by 1990 12% of the a will consist of single family dwellings.) population was 372,000, a 9.4% increase 0. Some areas in the cities of Canton and le are urbanizing rapidly. Gently rolling e contrasts with deep glacial valleys there erable evidence of glacial till composed of t, clay, and larger rocks. East Branch len Creek drops from 6 to 15 feet per mile a drainage area of 41.4 square miles.

Nearly all major floods are produced by winter and spring rains falling on saturated soil which is snow covered or frozen. The largest flood was in 1913, but damages are not known. Future flooding was predicted in this report by surveying the land and making a mathematical model of the watershed. Water surface profiles were computed for 25,50 and 100 year present condition flood and the 100 year future condition flood. Some of the 7 railroad and 23 highway bridges spanning the creek restrict flow. The 100 year event would cover 1,262 acres including 89 houses and 68 commercial buildings. A peak discharge of 8,047 cubic feet per second, along with water velocities up to 6.12 feet second are predicted. (Smith - North Carolina)
W76-12586

REPORT OF THE QU'APPELLE BASIN STUDY BOARD.
Saskatchewan Quappelle Basin Study Board, Regina.
For primary bibliographic entry see Field 5G.
W76-12587

MULTIPURPOSE COMPUTER FOR THE HONOLULU BOARD OF WATER SUPPLY,
Beck (R. W.) and Associates, Seattle, Wash.
For primary bibliographic entry see Field 4B.
W76-12589

FLOOD HAZARD INFORMATION: BACKLICK CREEK, VIOLET TOWNSHIP, FAIRFIELD COUNTY, OHIO.
Army Engineer District, Huntington, W. Va.
Prepared for the Ohio Department of Natural Resources, Columbus, and Violet Township, Ohio, 3 p, 1 fig, 2 plates. November 1972.

Descriptors: *Floods, *Flood profiles, *Flood plains, *Ohio, Zoning, *Flood plain zoning.
Identifiers: *Blacklick Creek(OH), Violet Township(OH), Big Walnut Creek(OH), Intermediate Regional Flood.

Magnitude and frequency of flooding along a 2.7 mile reach of Blacklick Creek, a tributary of Big Walnut Creek, are described. With an average slope of 9.6 ft per mile, the stream flows through a well-defined, heavily tree lined channel which averages 88 feet wide. The flood plains are rural and undeveloped, averaging 850 feet in width. Obstructions to flood flows include 4 bridges and natural vegetation. Although flood damages would be limited to crops and road crossings, these could be minimized by application of the flood plain ordinance for which the data herein have been developed. With a streambed elevation of 778.8 feet (mean sea level datum) the Intermediate Regional Flood would be expected to crest at 791 ft msld at Penn Central RR and Refugee Road and 829 msld at Interstate Route 70 where the approximate streambed is 815 msld. Extent of potential flooding is shown on a topographic map. Information is on file with the Army Corps of Engineers to determine flood plain encroachments on a case by case basis for specific locations. (Salzman-North Carolina)
W76-12592

FLOOD PLAIN INFORMATION: FRESHWATER CREEK, HUMBOLDT COUNTY, CALIFORNIA.
Army Engineer District, San Francisco, Calif.
Prepared for Humboldt County, Calif., October 1975. 15 p, 5 fig, 9 plates, 4 tab.

Descriptors: *Flash floods, Floods, *Tidal waters, *Peak discharge, *Flood protection, *Non-structural alternatives, *California, Flood flow, Flood stages, Flow characteristics, Flood plain zoning, Planning.
Identifiers: *Freshwater Creek(CA), Humboldt County(CA), Intermediate Regional Flood, Standard Project Flood.

Freshwater Creek lies in a small coastal mountain basin draining 34 square miles above its confluence with Ryan Slough. Primarily rural with some unincorporated urban development, the flood plains are subject to increasing development, with areas best suited for future urbanization lying along the eastern edge of the City of Eureka, the county seat. In its upper basin the stream slopes at 315 feet per mile, yet averages only 34 ft/mi in the lower basin. Flood season extends from October to April resulting from heavy rains. Floods rise to extreme flood peaks in a short period of time with high velocities in the main stream channels. High tide on Arcata Bay and a flood stage in Freshwater Creek presents an extremely hazardous condition. No flood control works exist; however, implementation of flood plain ordinances and regulations are underway. Because no gaging stations exist, no flood records have been kept except for news reports which indicate that the floods of 1955 and 1965 inundated developed properties. An Intermediate Regional Flood would have an estimated peak discharge of 10,000 cubic feet per second at Freshwater Corners with channel velocities of 4 to 6 ft/sec in the lower reaches, 1 to 3 ft/sec overbank. About 4,000 acres would be flooded by an IRF. A Standard Project Flood would have an estimated peak discharge of 13,800 cfs at Freshwater Corners with slightly higher channel and overbank velocities. (Salzman-North Carolina)
W76-12593

FLOOD PLAIN INFORMATION: YELLOW RIVER, PART III, METROPOLITAN ATLANTA, GEORGIA.
Army Engineer District, Savannah, Ga.
Prepared for Atlanta Regional Commission, Georgia, June 1973. 32 p, 14 fig, 37 plates, 6 tab.

Descriptors: *Floods, *Flood profiles, *Flood plains, *Storms, Flow characteristics, *Peak discharge, *Georgia, Flood damage, Warning systems, Nonstructural alternatives, Historic floods, Flood data, Flood frequency, Obstructions to flow.
Identifiers: *Yellow River(GA), Pew Creek(GA), Redland Creek(GA), Little Sewanee Creek(GA), *Atlanta(GA), Lawrenceville(GA), Intermediate Regional Flood, Standard Project Flood.

This report presents flood information on a 14.5 mile reach of Yellow River, a 2 mile reach of Pew Creek, a 2 mile reach of Redland Creek and a 3.5 mile reach of Little Sewanee Creek. Located northeast of Atlanta, these streams drain 46.3 square miles above the study area and are characterized by narrow flood plains and slopes ranging from 7 to 45 feet per mile. There are no developments in the narrow flood plain of the Yellow River which are subject to flooding. Existing development in the flood plains is limited to the upper reaches of Redland Creek in the City of Lawrenceville. Expansion of the Atlanta area is expected to bring the flood plains under development pressure in the near future. Vegetation, bridges and culverts in the study area can obstruct floodflows. Flooding can occur in any season and can result from thunderstorms, tropical depressions, and general rainstorms. Five damaging floods have occurred since 1919. Peak discharge during the February 1961 flood reached 9,080 cubic feet per second on the Yellow River as 11.54 inches of rain fell. The Intermediate Regional and Standard Project Floods would have peak discharges of 6,230 and 15,580 cfs, respectively. IRF would flood 1,120 acres and 11 buildings, would rise 15 feet in 24 hours and remain above bankfull 36 hours. Channel velocities during an IRF would be 3-12 ft/sec with overbank velocities 2-3 ft/sec. The SPF would inundate 2,660 acres and 39 buildings and would rise 22 feet in 36 hours and remain above bankfull for 60 hours. In the Atlanta area only Gwinett County has flood plain regulations. (Henly-North Carolina)
W76-12595

SEWER LAYING SYSTEM,
For primary bibliographic entry see Field 8B.
W76-12605

URBAN RUNOFF AND COMBINED SEWER OVERFLOW, (LITERATURE REVIEW),
Environmental Protection Agency, Edison, N.J. Wastewater Research Div.
For primary bibliographic entry see Field 5D.
W76-12627

MIXING AND TRANSPORT, (LITERATURE REVIEW),
Argonne National Lab., Ill. Energy and Environmental Systems Div.
For primary bibliographic entry see Field 5B.
W76-12672

4B. Groundwater Management

GROUNDWATER PROPERTY RIGHTS AND CONTROVERSIES IN MONTANA,
Montana State Univ., Bozeman. Dept. of History, Government and Philosophy.
For primary bibliographic entry see Field 6E.
W76-12154

COMPARATIVE SURVIVAL OF INDICATOR BACTERIA AND ENTERIC PATHOGENS IN WELL WATER,
Montana State Univ., Bozeman. Dept. of Microbiology.
For primary bibliographic entry see Field 5A.
W76-12194

CARBON CONTENTS OF SURFACE AND UNDERGROUND WATERS IN SOUTH-CENTRAL MINNESOTA,
Minnesota Univ., Minneapolis. Dept. of Civil and Mineral Engineering.
For primary bibliographic entry see Field 5A.
W76-12202

DIGITAL MODEL TO PREDICT EFFECTS OF PUMPING FROM THE ARIKAREE AQUIFER IN THE DWYER AREA, SOUTHEASTERN WYOMING,
Geological Survey, Cheyenne, Wyo.
G. C. Lines.
Water-Resources Investigations 8-76 (open-file report), February 1976. 24 p, 14 fig, 1 tab, 12 ref.

Descriptors: *Model studies, *Groundwater resources, *Projections, *Wyoming, *Computer models, Aquifer characteristics, Potentiometric level, Water levels, Leakage, Pumping, Water utilization, Hydrogeology, Forecasting, Maps, Simulation analysis, Drawdown.
Identifiers: Southeastern Wyoming.

A digital computer model was developed and used to simulate an unconfined sandstone aquifer (Arikaree aquifer) in about 340 square miles in southeastern Wyoming. The model was calibrated by comparing observed and calculated changes in the potentiometric surface and leakage from the aquifer along streams during water year 1974. The comparison was fairly good for changes in the potentiometric surface and was good for leakage. The calibrated model was used to predict changes in the potentiometric surface and leakage through water year 1979, assuming no new ground-water development after 1974 and 6.5 percent of the normal precipitation as recharge to the aquifer. Water-level declines of as much as 14 feet (4.3 meters) were predicted, but much of the area would be relatively unaffected. The total predicted decrease in leakage between water years 1974 and 1979 was about 500 acre-feet per year; the greatest decrease was predicted along streams closest to areas of pumpage. (Woodard-USGS)
W76-12277

THE SHALLOW AQUIFER--A PRIME FRESHWATER RESOURCE IN EASTERN PALM BEACH COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 2F.
W76-12278

WATER AVAILABILITY OF MONROE COUNTY, ALABAMA,
Geological Survey, Tuscaloosa, Ala.
For primary bibliographic entry see Field 4A.
W76-12281

GUIDE TO THE AVAILABILITY OF HYDROLOGIC DATA, GREATER PITTSBURGH REGION, PENNSYLVANIA.
Geological Survey, Harrisburg, Pa.
For primary bibliographic entry see Field 7C.
W76-12282

ESTIMATING GROUNDWATER EVAPOTRANSPIRATION FROM STREAMFLOW RECORDS,
Geological Survey, Doraville, Ga.
For primary bibliographic entry see Field 2D.
W76-12285

GROUND-WATER RESOURCES IN THE LOMPOC AREA SANTA BARBARA COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 2F.
W76-12288

PRELIMINARY ANALYSIS OF GEOHYDROLOGIC DATA FROM TEST WELLS DRILLED NEAR CHALK POINT, PRINCE GEORGES COUNTY, MARYLAND,
Geological Survey, Parkville, Md.
F. K. Mack.
Open-file report 76-322, 1976. 31 p, 12 fig, 5 tab.

Descriptors: *Groundwater resources, *Water quality, *Water demand, *Urbanization, *Aquifer characteristics, Data collection, Water yield, Pumping, Water level fluctuations, Hydrogeology, Transmissivity, Projections, Water supply.
Identifiers: *Prince Georges County(Maryland), *Chalk Point(Maryland).

Continued growth of southern Maryland will entail demands for increases in ground-water withdrawals. Part of the process of evaluating ground-water resources in the Chalk Point area is the establishment of the relationship between quantities of water pumped from individual aquifers and the resulting effect on water levels in outlying areas. A test hole was drilled to 1,100 ft at a site several thousand feet north of the high-yielding wells. Utilizing data from the probe hole to determine screen positions, three observation wells were constructed at the site to provide separate wells in the Patapsco, Magothy, and Aquia aquifers. The water level in each of these monitoring wells is affected by barometric pressure and tidal changes in the nearby Patuxent River. The transmissivities of the sand in the Patapsco Formation screened from 832 to 842 ft below sea level; the Magothy aquifer and the Aquia Formation, as determined by water-level recovery tests, are 570 sq ft/day, 730 sq ft/day, and 1,176 sq ft/day, respectively. (Woodard-USGS)
W76-12289

GEOLOGY AND WATER RESOURCES OF BROWN COUNTY, SOUTH DAKOTA--PART II: WATER RESOURCES,
Geological Survey, Huron, S. Dak.
For primary bibliographic entry see Field 4A.
W76-12290

A NOTE ON COMPUTING FINITE DIFFERENCE INTERBLOCK TRANSMISSIVITIES
Geological Survey, Reston, Va
For primary bibliographic entry see Field 2F
W76-12292

CHEMICAL CHARACTERISTICS OF TH MAJOR THERMAL SPRINGS OF MONTANA,
Geological Survey, Menlo Park, Calif
For primary bibliographic entry see Field 2K.
W76-12293

RECENT ADVANCES IN ARTIFICIA RECHARGE,
Geological Survey, Austin, Tex.
D. C. Signor.
Paper presented at Proceedings of the Conferen of the Great Plains Resources Council, Denv Colorado, April 8-9, 1976. 17 p, 13 ref.

Descriptors: *Artificial recharge, *Aquifers, * recharge, *Infection wells, *Water spreadi Methodology, Water quality, Sediments, Che cal properties, Water treatment, Anaerobic b teria, Hydraulic conductivity, Infiltration rates.

This paper is concerned with the techniques of tificial recharge and the problems that confr their utilization. The approaches to solving th problems constitute the recent advances in art cial recharge. Two recharge techniques are co monly used: (1) Spreading basins, in which wa that is concentrated on the surface percola through overlying materials to the formation; (2) injection wells or shafts, in which there i direct connection from the surface to the for tion. Suspended sediment in the water that is to recharged by spreading is a serious problem. T sediment settles and is filtered out of the wate the basin surface and restricts subsequent infil tion as the surface becomes sealed by the fi grained materials. Recent work on this prob has been directed toward developing surface c ditions that minimize the sealing effect and tow removing sediment from the input water by che cal treatment. Recharge through injection w usually requires stringent water-quality conside tions, and recharge operations are generally successful than in spreading basins beca suspended sediment in the recharge water cl the formation near the well. Once the formatio clogged, it is difficult to remove enough sedim to completely rejuvenate the well. The prob can be avoided only if clear water is used recharge. (Woodard-USGS)
W76-12295

DEVELOPING A STATE WATER PL GROUND-WATER CONDITIONS IN UT SPRING OF 1976,
Geological Survey, Salt Lake City, Utah.
C. T. Sumsion.
Utah Division of Water Resources, Salt L City, Cooperative Investigations Report No 1976. 69 p, 40 fig, 2 tab, 15 ref.

Descriptors: *Groundwater resour *Withdrawal, *Water level fluctuations, *U *Data collections, Hydrologic data, Aqu characteristics, Water wells, Groundwater ba Water utilization, Irrigation, Hydrographs, Ma

This is the thirteenth report in an annual series describe ground-water conditions in Utah. Rep in the series are prepared cooperatively by U.S. Geological Survey and the Utah Divisio Water Resources, and contain information on construction, ground-water withdrawals, w level changes, and related changes in precipit and streamflow. Supplementary data such graphs showing chemical quality of water maps showing water-table configuration ar cluded in reports of this series only for those or areas for which applicable data are avai and are important to a discussion of char

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d-water conditions. This report includes in-
ıal discussions of selected major areas of
d-water withdrawal in the State for the
lar year 1975. Water-level fluctuations, how-
are described for the period spring 1975 to
1976. The estimated total withdrawal of
from wells in Utah in 1975 was about
0 acre-ft, which is about 80,000 acre-ft less
n 1974, but 90,000 acre-ft greater than the
ge annual withdrawal during 1965-74. Both
crease from 1974 and the increase over the
r average were due primarily to changes in
awals for irrigation. (Woodard-USGS)
2296

R-LEVEL CHANGES IN HWESTERN KANSAS, 1940-75,
ical Survey, Lawrence, Kans.
Pabst, and E. D. Jenkins.
Geological Survey Journal, (Lawrence), 76. 26 p, 2 fig, 1 plate, 2 tab, 18 ref.

tors: *Groundwater resources, *Irrigation *Water level fluctuations, *Kansas, *Basic llections, Water utilization, Water yield, g, Withdrawal, Drawdown, Aquifers. ers: Southwestern Kansas.

ter level in wells in unconsolidated deposits clined as much as 134 feet since 1940 in southwestern Kansas, primarily as a result nd-water withdrawals for irrigation. During , the number of irrigation wells increased out 360 to 7,000, and annual withdrawals mated to have increased from 60,000 to 0 acre-feet. Most of the water used in stern Kansas is withdrawn from wells d in unconsolidated deposits of Tertiary ternary age. The unconsolidated deposits e the Ogallala Formation of Pliocene age, differentiated deposits and alluvium of ene age. These deposits form the uncon- d aquifer. (Woodard-USGS)
97

D-WATER RESOURCES OF LANE AND COUNTIES, WESTERN KANSAS,
al Survey, Lawrence, Kans.
tentag, and L. E. Stullken.
Geological Survey, Lawrence, Irrigation 1, 1976. 37 p, 17 fig, 3 plates, 6 tab, 62

rs: *Groundwater resources, *Aquifer istics, *Water quality, *Irrigation, Water wells, Withdrawal, Water yield, vel fluctuations, Groundwater recharge, sivity, Hydrologic data, Maps. s: Lane and Scott Counties(Kans).

Scott Counties, Kansas, comprise an 444 square miles. Much of the area is un- saturated sand and gravel of Pliocene llala Formation) and Pleistocene age ntiated deposits) that form a major un- ed aquifer. The main body of the aquifer about 34 percent of Lane County and ercent of Scott County. A chalk aquifer, of fractures and solution openings in the Chalk of Late Cretaceous age, is being for irrigation in southeastern Scott sandstone aquifer, consisting of Upper d Lower Cretaceous rocks that underlie ties, is a potential source of ground elds of wells in the unconsolidated ge from 100 to 1,700 gpm. Yields from 0 gpm are available from wells that tap and solution openings in the chalk e sandstone aquifer is tightly cemented aces and wells in it may not yield suffi- r for irrigation. Results of chemical water samples from typical wells in the ers indicate that the concentration of uoride and dissolved nitrate locally ap- r exceeds the limits recommended by Department of Health and Environ- nking water. (Woodard-USGS)

W76-12298

MAPS SHOWING GROUND-WATER CONDITIONS IN THE HARQUAHALA PLAINS AREA, MARICOPA AND YUMA COUNTIES, ARIZONA--1975,
Geological Survey, Tucson, Ariz.
For primary bibliographic entry see Field 7C.
W76-12299

EFFECT OF CATTLE FEEDLOT WASTES UPON GROUND WATER--A COMMENTARY,
Texas Tech Univ., Lubbock. Dept. of Geosciences.
For primary bibliographic entry see Field 5B.
W76-12366

OUTLOOKS FOR THE FUTURE OF DEEP WELL DISPOSAL,
SCS Engineers, Reston, Va.
For primary bibliographic entry see Field 5E.
W76-12370

A SLUG TEST FOR DETERMINING HYDRAULIC CONDUCTIVITY OF UNCONFINED AQUIFERS WITH COMPLETELY OR PARTIALLY PENETRATING WELLS,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
For primary bibliographic entry see Field 2F.
W76-12432

GROUND-WATER AND SURFACE-WATER RELATIONSHIPS IN THE GLACIAL PROVINCE OF NORTHERN WISCONSIN - SNAKE LAKE,
Adolph Coors Co., Golden, Colo.
For primary bibliographic entry see Field 5G.
W76-12444

UNSTEADY FLOW TO A NONPENETRATING ARTESIAN WELL,
Singapore Univ. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2F.
W76-12445

THE DEPTH VS. DEPTH PLOT: AN AID TO SELECTING PIEZOMETER INSTALLATION DEPTHS IN BOREHOLES,
Piteau Gadsby Macleod Ltd. North Vancouver (British Columbia).
For primary bibliographic entry see Field 8B.
W76-12447

ANALYTIC SOLUTIONS FOR DETERMINING NATURALLY FRACTURED RESERVOIR PROPERTIES BY WELL TESTING,
Instituto Mexicano del Petroleo, Mexico City.
For primary bibliographic entry see Field 8B.
W76-12449

MULTIVARIATE ANALYSIS OF GEORGIA COASTAL PLAIN GROUNDWATERS,
Georgia Inst. of Tech., Atlanta. School of Geophysical Sciences.
For primary bibliographic entry see Field 2F.
W76-12466

WATER SUPPLIES FROM ULSTER VALLEY GRAVELS,
Institute of Geological Sciences, London (England). Dept. of Hydrogeology.
M. Price, and S. S. D. Foster.
The Institution of Civil Engineers, Proceedings, Part 2, Research and Theory, Vol 57, p 451-492, September 1974. 6 fig, 1 tab, 19 ref.

Descriptors: Water resources, *Water supply development, Geologic investigations, *Hydrologic aspects, *Groundwater, Evaluation, Storage, Recharge, Water demand, Industrial water, Economics, Pumping, Rivers, *Gravels.
Identifiers: *Valley gravels, *Ulster(United Kingdom).

Using four examples from Ulster, a discussion is presented of the extent to which techniques of geological exploration and hydrological analysis can be used in the practical evaluation of valley gravels as a water resource. Limitations arise from the geological heterogeneity of these strata and from financial constraints relating to their overall potential, but it is usually possible to make reliable semi-quantitative evaluations of the recharge and storage elements, thus permitting logical water-supply development. Results show that under suitable conditions, valley gravels can be developed to provide low-cost water supplies, particularly where industrial demands of about 10 Ml/day exist. In addition to lower capital and running costs, such schemes have the advantage of utilizing natural storage, albeit limited. (Bell-Cornell)
W76-12524

INTEGRATED MATHEMATICAL MODELS USED FOR GROUNDWATER RESOURCES PLANNING IN AREAS INFLUENCED BY HUMAN SETTLEMENTS,.
Technische Universitaet, Hanover,(West Germany). Institut fuer Wasserwirtschaft, Hydrologie und Landwirtschaftlichen Wasserbau.
G. Battermann, and R. Mull.
In: The Use of Computer Techniques and Automation for Water Resources Systems, Washington, D. C., 1974, Volume II. p 29-32. 6 ref.

Descriptors: *Simulation analysis, Computers, *Groundwater resources, *Planning, Mathematical models, Effects, Evaluation, Parametric hydrology, Systems analysis.
Identifiers: Human interference.

The extension of settlements and industrial areas influence groundwater systems, causing both qualitative and quantitative problems. This article reports on investigations made by Battermann in 1973 to integrate most of these problems in a groundwater model. Hanover, Germany was chosen study area. Discussed are: analog, digital, and hybrid simulation methods used in parallel to investigate the groundwater basin affected; parameter evaluation; and the effects of some interferences, such as marshy ground or wet cellars. The cited examples show the problems connected with the evaluation of groundwater budgets in areas affected by human interference. The different computer technqiues allow a good knowledge to be obtained of the parameters influencing the observed systems. A prediction of the behavior of the system in the future under given circustances can be derived from these simulations. (See also W76-12535) (Bell-Cornell)
W76-12543

OPTIMIZATION OF GROUNDWATER WITHDRAWALS WITH REGARD TO TECHNICAL AND HYDROLOGICAL CONSTRAINTS,
Technische Universitaet, Hanover (West Germany). Institut fuer Wasserwirtschaft, Hydrologie und Landwirtschaftlichen Wasserbau.
H. Hames, and B. Hoffmann.
In: The Use of Computer Techniques and Automation for Water Resources Systems, Washington, D. C., Volume II, p 33-36, 5 ref.

Descriptors: *Groundwater, *Withdrawal, Hydrology, *Optimization, *Constraints, Technology, Water supply, Planning, Hydraulics, Methodlogy, Wells, Pumping, Computers, Equations, Systems analysis.
Identifiers: *Operating plans.

The optimum use and management of available water such as that found in a groundwater reservoir are subject to hydrological and fluid-mechanical restriction; there are also technical constraints caused by size and type of pumping devices. These restrictions and the application of numerical methods require the use of high-speed computers for the prediction of possible water pumpage to aid the engineer in planning. As groundwater will become an increasingly important resource, this paper outlines a methodology for optimizing the use of a groundwater reservoir. The method permits the delivery of operation plans for water-supply devices under the consideration of hydrological and technical--or other--constraints. (See also W76-12535) (Bell-Cornell)
W76-12544

SURFACE WATER AND GROUND WATER INTERACTION PHENOMENA IN PLANNING MODELS,
Geological Survey, Washington, D. C.
T. Maddock, and D. W. Moody.
In: The Use of Computer Techniques and Automation for Water Resources Systems, Washington, D.C., April 1974, Vol. II, p 112-125. 1 fig, 2 tab, 9 ref.

Descriptors: *Water resources, *Long-term planning, *Surface waters, *Groundwater, *Conjunctive use, Mathematical models, Projects, Equations, Economics, Capital costs, Operating costs, Constraints, Water demand, Hydraulic aspects, Pumping, Aquifers, Wells, Rivers, Optimization, Simulation analysis, Water supply, Evaluation, Systems analysis.
Identifiers: *Mixed-integer programming, Screening, Cost minimization, Interactions.

In planning a water resources system, given a set of feasible water supply projects, a planner might wish to determine which projects could meet future water demands at minimum cost. For screening and sequencing proposed projects, the planner needs an optimization model which explicitly includes surface and ground water interactions in its formulation. This paper describes such a long-range planning model which utilizes mixed-integer programming to minimize the present value of capital and operating costs over a specified planning horizon. A well field may consist of many wells all of which interact with each other and with the stream system. Herein, interactions are expressed in the form of a constraint which limits the amount of water withdrawn from a stream, either directly by diversions and reservoirs or indirectly by ground water pumping, to the quantity of surface water available above that needed to meet downstream flow requirements. The planning model is deterministic. To obtain statistical measures of the performance of a proposed system, subject to variations in streamflow, water demands, etc., the system's operations must be simulated. Discussed is the use of optimization and simulation models and the procedure of aggregation-disaggregation. (See also W76-12535) (Bell-Cornell)
W76-12553

MULTIPURPOSE COMPUTER FOR THE HONOLULU BOARD OF WATER SUPPLY,
Beck (R. W.) and Associates, Seattle, Wash.
S. M. Alexander.
Journal American Water Works Association, Vol. 68, No. 3, p. 147-155. March 1976. 1 fig, 1 plate, 2 ref.

Descriptors: Water resources, *Water management(Applied), *Water supply, *Computer models, *Hawaii, Water, Groundwater, Acquifer management, Networks, Computers.
Identifiers: *Honolulu(HI), *Network analysis.

In order to effectively manage available water resources and operating pumping facilities economically, the Island of Oahu, Hawaii, City and County of Honolulu, has installed an automatic computer control system. The system contains a central processor, core and mass memory to watch over the very complex water supply. Ideally, water is not pumped from acquifer ata rate which exceeds recharge from rain, but at times it has been necessary to surpass this limit. At present the island is divided into 8 primary service areas, but the water board plans to integrate the system and to install booster pumps in some locations to overcome large friction losses in pipes. The control system will supply the requirements of water-system customers within prescribed pressure limits, monitor system operations and alarm detection, manage water resources, utilize available reservoirs to optimum capacity within prescribed constraints, and minimize the cost of pumping. Fixed response control, using a statistical model to predict system requirements, could be used to operate the system, but this must be changed when system parameter change and optimum results will not be obtained. Rather, a dynamic response model has been chosen. This is based on real-time operating analysis of the system through a network analysis model and measuring flows in and out of areas. A great many other accounting and calculating functions are built into the system. Perhaps $20,000 per year will be saved by the system as well as providing improved operation. (Smith - North Carolina)
W76-12589

MIXING AND TRANSPORT, (LITERATURE REVIEW),
Argonne National Lab., Ill. Energy and Environmental Systems Div.
For primary bibliographic entry see Field 5B.
W76-12672

4C. Effects On Water Of Man's Non-Water Activities

HYDROLOGIC IMPACT OF BURNING AND GRAZING ON A CHAINED PINYON-JUNIPER SITE IN SOUTHEASTERN UTAH,
Utah State Univ., Logan. Dept. of Range Science.
G. F. Gifford, J. C. Buckhouse, and F. E. Busby.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 476, $4.00 in paper copy, $3.00 in microfiche. Utah Water Research Laboratory, Logan, Publication PRJNR012-1, June 1976. 22 p, 21 f ig, 9 tab, 10 ref. OWRT A-022-UTAH(1). 14-34-0001-6046.

Descriptors: Water quality, *Grazing, Pinyon pine trees, Juniper trees, Nutrients, Soil moisture, Infiltration, Sediments, *Burning, *Utah, Overland flow, Runoff, Coliforms, *Phosphorus, *Potassium, Pollutant identification.
Identifiers: Southeastern Utah, Pinyon-juniper tree type.

Bacterial analysis (fecal and total coliform) of runoff water from infiltrometer plots indicated that the potential public health hazard of livestock grazing on semiarid open range on gentle slopes is probably minimal. Significantly increased amounts of phosphorus and potassium were measured in overland flow following burning on chained-with-debris-left-in-place sites, but no changes were detected in calcium, sodium, or nitrate-nitrogen contents in runoff due to differences in land treatment. One season of grazing was sufficient to depress infiltration rates, though no significant changes were recorded in terms of potential sediment production under either grazing or burning. Soil moisture patterns were not significantly altered during the course of this study as a result of either the grazing or burning treatment.
W76-12153

MAJOR FLOODS, POOR LAND USE DEL RETURN OF SEDIMENTATION TO NORM RATES,
Forest Service (USDA), Berkeley, Calif. Pac
Southwest Forest and Range Experiment Statio
For primary bibliographic entry see Field 4D
W76-12157

REVEGETATING DEVASTATED SITES NEW MEXICO WITH WESTERN WHE GRASS TRANSPLANTS,
Rocky Mountain Forest and Range Experim Station, Fort Collins, Colo.
E. F. Aldon, O. D. Knipe, and G. Garcia
USDA Forest Service Research Note RM- June 1973. 3 p, 1 fig, 5 ref/

Descriptors: *Revegetation, *Wheatgrasses, stabilization, *New Mexico, Plant physiology.
Identifiers: Plant transplants.

Western wheatgrass (Agropyron smithii Ry survived well and produced daughter plants f rhizomes during the first year when good s were grown to 3-month-old transplants, then t ferred to sandy or clay loam sites at elevatio around 7,500 feet. (Forest Service)
W76-12161

WATER YIELD IMPROVEMENT RESEA OF THE PACIFIC SOUTHWEST FOREST RANGE EXPERIMENT STATION AND USEFULNESS TO WILDLAND RESOU MANAGEMENT,
Forest Service (USDA), Berkeley, Calif. Pa
Southwest Forest and Range Experiment Stat
J. L. Smith.
In: Proceedings Lake Tahoe Research Se IV, Lake Tahoe Reserve Coordinating B Lake Tahoe Environmental Education Con um, South Lake Tahoe, Calif. April 1975, p 1975. 1 tab, 30 ref.

Descriptors: *Snow management, *Snow *Snowpacks, Tracers, Radioisotopes, * management, Water management(App *Water yield improvement, *Vegetation ef *Model studies.

The project mission was to determine the eff vegetation manipulation upon snow accumu and melt, so that the changes imposed by v tion manipulation can be programed to accon the desired purpose. An ultimate goal is to de a model that can be used to estimate suc under any level of plant cover and for any co of soil, aspect and slope. The results of the suggest a feasible approach in developing s model. Water balances are computed by co ing calculations for plant water use, soil movement and energy balance. The c research task is the combining of all snow hy gy data into models of snowmelt with which manager, prior to timber harvest, may predi effects of alternative land management pra upon time of water delivery to the strea second task is the combining of the snow hy gy, plant water use and soil water movemer into models with which the land manage determine prior to harvest the optimum fo harvest cut for maximizing water yield, ae considerations, change in time of water yi other management objectives. (Forest Servi
W76-12170

POTENTIAL EFFECTS OF FOREST MA MENT PRACTICES ON STORM SOURCES AND WATER QUALITY,
Forest Service (USDA), Oxford, Miss. So
Forest Experiment Station.
For primary bibliographic entry see Field 5C
W76-12173

LIBRARY U. OF I. URBANA-CHAMPAIGN

CDIMENT YIELDS FROM ROADSIDES: AN PPLICATION OF THE UNIVERSAL SOIL OSS EQUATION,
isconsin Univ., Green Bay. Science and En-ronmental Change.
J. Meyer, P. J. Schoeneberger, and J. H. iddleston.
urnal of Soil and Water Conservation, Vol. 30, . 6, p 289-291, November-December 1975. 1 fig, ab, 13 ref. NSF GY-11248.

scriptors: *Sediment yield, *Roadbanks, rosion, *Wisconsin, Pollutants, On-site labora-ies, On-site tests, On-site data collections.
ntifiers: *Universal soil loss equation, ewaunee River, *School Creek watershed, nvegetated.

e rates of erosion were estimated from a mber of nonvegetated roadsides by determining dcut geometry and substituting for parameters the universal soil loss equation. The average e of erosion from 104 separate sites was 354 s of soil per acre per year. The estimate was ified by measuring sediment yield from plot ablished on selected roadsides. Differences in dibility between surface soils and subsoils, iations associated with the length of the sam-g period, and variations in rainfall patterns ac-nted for the differences between measured and dicted erosion rates. (Bhowmik - ISWS)
6-12206

STUDY OF THE EFFECTS OF STREAM ANNELIZATION AND BANK STABILIZA-ON ON WARMWATER SPORT FISH IN VA: SUBPROJECT 5: EFFECTS OF LONG-ACH STREAM CHANNELIZATION ON DIS-IBUTION AND ABUNDANCE OF FISHES,
a Cooperative Fishery Unit, Ames.
V. Menzel, and H. L. Fierstine.
ort FWS/OBS-76-15, July 1976. 108 p, 3 fig, 28 39 ref, 4 append. FWS 14-16-0008-745.

criptors: *Channeling, Fish, *Iowa, Rivers, ams, *Stream morphology, Turbidity, itats, Aquatic populations, Populations, ambed, Fish types, *Distribution patterns, Ju-le fishes, Catfishes, Carp, Rough fish, Shore-vegetation, Bullheads, Sunfishes, Flow rates, vement.
ntifiers: *Stream channelization, *Long-hed channelization, Stream types, Sinuosity, dient, Bedform, Species diversity, North Rac-n River, Big Cedar Creek, Hardin Creek, Buf- Creek, North Branch Lizard Creek, Sub-es, Stream cover, Woodland streams, Prairier m.

y-one species of fishes from 11 families were cted. In most samples, cyprinids and stomids dominated the catch numerically and veight. The streams supported only limited bers of game fishes, channel catfish being the important of these. Catches were highly vari- and there was no strong correlation between s fish abundance, measured in catch/effort, either stream sinuosity or gradient. The ce of dominant species shifted according to ent, however. Young-of-year fishes were abundant in meandering stream segments, here was a significant (P = .01) positive cor-on between channel sinuosity and catch of ju-e fishes. Most of the species collected were le stream types or were wide-ranging in dis-tion. These fishes exhibited affinities for a bottom and tended to be negatively corre- with gradient, variance of velocity and oc-nce of a pool-riffle sequence. An Ozarkian yofaunal element was more prominent in the r gradient, firmer bottomed woodland ms. The species diversity index tended to be ssed at high water levels and in situations of urbidity, reflecting lower sampling efficiency such conditions. Species diversity, mea- both in terms of numerical abundance and ass, was generally greatest in unchannelized woodland stream segments. There was little difference in this index between natural and channelized prairie stream stations. Species diversity, therefore, appeared to be primarily a function of stream gradient. Pectoral fin-clipped fishes were recaptured in higher percentages in natural stream segments than in channelized areas. Additionally, there was evidence for greater fish movement between proximate channelized stations than between natural areas. These data suggest that there is greater fish movement throughout straightened reaches. Condition factor and length-weight relationships of channel catfish, carp and river carpsucker showed little difference between collections from channelized and unchannelized areas. This may be attributable to extensive movements of the fishes between the two habitat types. (FWS)
W76-12230

A STUDY OF THE EFFECTS OF STREAM CHANNELIZATION AND BANK STABILIZATION ON WARMWATER SPORT FISH IN IOWA: SUBPROJECT 4: THE EFFECTS OF LONGREACH CHANNELIZATION ON HABITAT AND INVERTEBRATE IN SOME IOWA STREAMS,
Iowa Cooperative Fishery Unit, Ames.
D. Zimmer, and W. Bachmann.
Report FWS/OBS-76-14, May 1976. 87 p, 7 fig, 8 tab, 24 ref, 2 append. FWS 14-16-0008-745.

Descriptors: *Channeling, Rivers, Streams, *Iowa, *Habitats, Invertebrates, *Channel morphology, Flow rates, Shore-line cover, Streambed, Bedform.
Identifiers: *Long-reach channelization, *Stream channelization, *Invertebrate drift, Gradients, Sinuosity, Habitat diversity, Depth, North Raccoon River, Big Cedar Creek, Hardin creek, Buffalo Creek, North Branch Cedar Creek, Boone River, Cedar Creek, Lizard Creek, Stream cover, Sinuosity, Stream type.

Relationships between channel morphometry, habitat diversity, and invertebrate drift density were studied in 11 natural and channelized stream segments of the upper Des Moines River Basin during 1974 and 1975. Gradients of the study sites ranged from 0.17 to 2.18 m/km; sinousity index values were between 0.95 and 1.67. The most obvious effect of channelization on stream habitat was a reduction in the diversity of water depth and current velocity. There was a significant (P=.05) positive correlation between channel sinuosity and the variability of stream depth and velocity. Invertebrate drift density, expressed as biomass and total counts, was also correlated with channel sinuosity. Sinuous streams had greater concentrations of drifting organisms than did straight channels. There was no relationship between drift density and channel gradient. The impact of channelization on habitat diversity and invertebrate drift density might be minimized if channels were designed with greater sinuosity index values. (FWS)
W76-12231

A STUDY OF THE EFFECTS OF STREAM CHANNELIZATION AND BANK STABILIZATION ON WARMWATER SPORT FISH IN IOWA: SUBPROJECT NO. 3 SOME EFFECTS OF SHORT-REACH CHANNELIZATION ON FISH AND FISH FOOD ORGANISMS, IN CENTRAL IOWA WARM WATER STREAM,
Iowa Cooperative Fishery Unit, Ames.
L. R. King, and K. D. Carlander.
Report FWS/OBS-76-13, April 1976. 217 p, 6 fig, 19 tab, 28 ref, append. FWS 14-16-0008-745.

Descriptors: *Channeling, *Fish food organisms, Fish, *Iowa, Streams, Rivers, Channel morphology, Dissolved oxygen, Turbidity, Flow rates, Invertebrates, Benthos, Benthic fauna, Plankton, Aquatic populations, Food habits, Bridge construction, Shore-line cover, Discharge(Water), Sampling, Bullheads, Catfishes, Channel catfishes, Sunfishes, Bass, Carp, Minnows, Rough fish, Fish types, *Bank stabilization.
Identifiers: *Stream channelization, Beaver Creek, Black Hawk Creek, Tipton Creek, Honey Creek, South Fork Iowa River, Short-reached channelization, Stream cover.

Six central Iowa streams were studied in 1974 to determine whether fish and fish food organisms were affected by short-reach channelization associated with bridge replacement in the last 15 years. In all cases the streams had been previously modified in the original bridge construction. The recent construction involved loss of 151 to 429 m of stream length in three streams and in the other streams the new channel was the same length as before. This would involve a loss of up to 18% of the stream if a bridge were built on each section line. Downstream the channel was narrower and shallower and perhaps had less brush shelter than upstream from the channel. Brush shelter was lacking in 2 of the 3 streams channelized in the last 2 years but had recovered somewhat, but not completely, in those channelized 10-15 years earlier. There was no evidence that dissolved oxygen, turbidity, or stream macroinvertebrates as measured by core, drift or artificial substrate samples differed upstream, in the channel, or below. Reduction of brush substrate in the channel and downstream would mean reduction in invertebrate production, however. More fish species were collected by electroshocking in unchannelized than in channelized localities in 5 of the 6 streams and in the 6th the number of species was the same in both localities. In 2 recently channelized streams that lacked cover in the channel, catches of fish were significantly less in the channelized than in the unchannelized localities, but in 3 streams channelized 10 to 15 years where some cover had developed, catches in the channel runs were similar or significantly greater than in unchannelized runs. In the unchannelized locations, however more of the fish were in brush and total populations were not adequately represented by electroshocking in the runs. The most evident impact of short-reach channelization is the removal of cover in the altered area and the loss of stream length. (FWS)
W76-12232

A STUDY OF THE EFFECTS OF STREAM CHANNELIZATION AND BANK STABILIZATION ON WARMWATER SPORT FISH IN IOWA: SUBPROJECT 2. A STUDY OF THE IMPACT OF SELECTED BANK STABILIZATION STRUCTURES ON GAME FISH AND ASSOCIATED ORGANISMS,
Iowa Cooperative Fishery Unit, Ames.
A. L. Witten, and R. V. Bulkley.
Report FWS/OBS-76-12, May 1976. 116 p, 7 fig, 15 tab, 23 ref, 4 append. FWS 14-16-0008-745.

Descriptors: *Bank stabilization, *Retaining walls, *Iowa, *Jetties, Streams, Rivers, *Channel morphology, Water temperature, Turbidity, Invertebrates, Benthos, Fish food organisms, Flow rates, Aquatic populations, Depth, Channel catfish, Catfishes, Bullheads, Sunfishes, Size, Populations, Mayflies, Caddisflies, Structures, Fish.
Identifiers: Skunk River, Soldier River, Wire retard, Permeable jetties, Impermeable jetties, Black bullhead, Green sunfish, *Stream channelization, *Retards, *Fish habitats.

Four types of bank stabilization structures installed mainly for highway protection--revetments, retards, permeable jetties, and impermeable jetties--were studied during the summer and fall of 1974 to determine their impact upon game fish habitat in Iowa streams. Stream width, depth, current velocity, water temperature, and turbidity were measured. Permeable jetties and retards deepened the channel near the structures. Maximum stream depth at or near these structures was from 7 to 110% greater than maximum depth in control sections of the streams. No other signifi-

cant differences in physical parameters between structured and non-structured sections of stream were found. No significant differences (P=0.99) were found in mean body length or abundance of channel catfish (Ictalurus punctatus), black bullhead (Ictalurus melas), and green sunfish (Lepomis cyanellus) between structured and non-structure sections of stream. Unusually high water during the sampling period may have allowed fish to remain dispersed throughout the streams rather than concentrating in the deeper pools at or near some of the stabilization structures, as might be expected in a drier year. Rock revetments and impermeable jetties fostered the growth of some invertebrates (primarily mayflies and caddisflies); these invertebrates were also found in a large percentage of game fish stomachs examined. Revetments, which presented the most rock surface for invertebrate colonization, had the gratest impact on invertebrate abundance A long rock jetty, extending far enough into the stream to produce a scour hole, would combine most of the advantages noted in the structures studied. From the standpoint of habitat improvement, rock seems superior to steel as a construction material, and structures which cause the formation of scour holes superior to those which do not deepen the stream. (FWS)
W76-12233

A STUDY OF THE EFFECTS OF STREAM CHANNELIZATION AND BANK STABILIZATION ON WARM WATER SPORT FISH IN IOWA: SUBPROJECT I INVENTORY OF MAJOR STREAM ALTERATIONS IN IOWA,
Iowa Cooperative Fishery Unit, Ames.
R. V. Bulkley.
Report FWS/OBS-76-11, July 31, 1976. 338 p, 1 fig, 4 tab, 14 ref, 2 append. FWS 14-16-0006-745.

Descriptors: *Iowa, Streams, *Channeling, Rivers, Census, *Bank stabilization, Aerial photography, Drainage area, Measurement, History, Surveys.
Identifiers: *Sinuousity(Streams), *Stream channelization, Big Sioux River(Iowa).

Aerial photographs and public records were used to determine the amount of channelization of Iowa streams with drainage areas greater than 50 square miles. The extent of channelization was determined by measuring stream sinuosity. It is estimated that from 1000 to 3000 miles of streams have been lost in Iowa since settlers first arrived. (FWS)
W76-12234

WARM WATER STREAM ALTERATION IN IOWA: EXTENT, EFFECTS ON HABITAT, FISH, AND FISH FOOD, AND EVALUATION OF STREAM IMPROVEMENT STRUCTURES (SUMMARY REPORT),
Iowa Cooperative Fishery Unit, Ames.
R. V. Bulkley, R. W. Bachmann, K. D. Carlander, H. L. Fierstine, and L. R. King.
Fish and Wildlife Service, FWS/OBS-76-16, July 1976. 39 p, 3 fig, 11 tab, 33 ref. FWS 14-16-0008-745.

Descriptors: *Channeling, *Iowa, Rivers, Streams, Aquatic populations, Populations, *Fish food organisms, Bridge construction, *Bank stabilization, *Habitats, Depth, Flow rates, Structures, Invertebrates, *Stream improvement, *Channel improvement.
Identifiers: *Stream channelization, Habitat diversity, Sinuosity, Species diversity, Long-reach channelization, Short-reach channelization, Invertebrate drift, Stream cover, Gradient.

Summarized are results given in 5 other subproject reports. Studies were conducted from 1973 to 1976 to determine the extent of stream channelization in Iowa, differences in populations of fish and fish-food organisms in channelized and unchannelized streams, effects of stream alterations for highway bridge construction, and the value of stream-bank stabilization structures to fish habitat. Over 1000 miles of stream capable of supporting permanent fish populations were lost in Iowa through stream channelization. Channelization resulted in more uniform water depth and current velocity in the resulting stream with a reduction in habitat diversity. Sinuous streams had greater concentrations of drift organisms than did straightened channels. More species of fish were found in natural sections, although fish were as abundant in short-reach sections (ca. 0.5 km) channelized 10-15 years ago as in natural sections wherever brush piles and trees had accumulated in the stream. Certain structures installed in Iowa streams to protect highway bridges improved fish habitat by producing scour holes and providing cover and substrate for fish-food organisms. No additional long-reach (1.0 km) channelization should be conducted+ effects of short-reach projects can be lessened by leaving as much meander in the stream as possible and by proper placing and design of bank-stabilization strucutures. (FWS)
W76-12235

SEDIMENT DISCHARGE FROM HIGHWAY CUT-SLOPES IN THE LAKE TAHOE BASIN, CALIFORNIA, 1972-74,
Geological Survey, Menlo Park, Calif.
C. G. Kroll.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-255 225, $5.00 in paper copy, $3.00 in microfiche. Water-Resources Investigations 76-19, May 1976. 85 p, 14 fig, 13 tab, 18 ref.

Descriptors: *Sediment transport, *Erosion rates, *Road construction, *Lake basins, Streamflow, Drainage systems, Highways, Data collections, Sediment yield, Slopes, *California.
Identifiers: *Lake Tahoe basin(Calif), Highway cut-slopes.

Streamflow and fluvial-sediment discharge data were collected at selected streams and highway gutters in Lake Tahoe basin, Calif., to determine the extent of erosion from highway cuts and to attempt to evaluate the effects of various land-treatment practices to reduce erosion. Estimate of long-term annual total-sediment discharge from six streams into the lake is 7,100 tons, of which 2,300 tons is finer than 62 micrometers. During 1972-74, snowmelt runoff (April-July) accounted for 65 percent of the water and sediment discharge. Approximately 90 percent of the sediment is transported in suspension. Sediment measured at 16 gutterflow stations at the base of highway cut-slopes indicates that less than 100 tons of fine sediment per year are contributed to the lake from all California State highway cuts. Sediment-transport rates are highly variable, and an unknown part of the measured sediment was derived from sources other than highway cuts. Data were not adequate to demonstrate the effectiveness of treatments to stabilize cut-slopes. (Woodard-USGS)
W76-12279

PAVEMENT CRACKING IN WEST TEXAS DUE TO FREEZE-THAW CYCLING,
Texas A and M Univ., College Station. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2C.
W76-12452

4D. Watershed Protection

MAJOR FLOODS, POOR LAND USE DELAY RETURN OF SEDIMENTATION TO NORMAL RATES,
Forest Service (USDA), Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station.
H. W. Anderson.
Pacific Southwest Forest and Range Experiment Station, USDA Forest Service Research Note PSW-268, 1972. 4 p, 1 fig, 3 tab, 10 ref.

Descriptors: *Watershed management, *Forest management, Streamflow, *Floods, Sediment transport, *Sedimentation, Water quality, Forecasting, *Land use, *California, Monitoring, Lumbering.

Recovery from flood-accelerated sedimentation affects both estimates of long-term averag deposition and short-term monitoring of change 'Years to return to normal' for 10 watersheds i northern California after a major flood accelerate sediment concentrations were analyzed. Return to normalcy took from 0 to 9 years; rate of declin was related to both amount of initial acceleratio by the flood and differences in watersheds. Yea to recovery increased with these four factor coefficient of path lengths in the watersheds, are of poor logging, area of steep grassland, and pe cent of area in sedimentary rock types Cenozoic younger. (Forest Service)
W76-12157

A UNIFORM MEASURE OF SUBAERIAL ERO SION,
Colorado Univ., Boulder. Inst. of Arctic and A pine Research; and Colorado Univ., Boulde Dept. of Geography.
For primary bibliographic entry see Field 2J.
W76-12191

DERIVATION OF TIME OF CONCENTRA TION,
New Mexico Inst. of Mining and Technolog Socorro.
For primary bibliographic entry see Field 2E.
W76-12196

SEDIMENT YIELDS FROM ROADSIDES: A APPLICATION OF THE UNIVERSAL SO LOSS EQUATION,
Wisconsin Univ., Green Bay. Science and E vironmental Change.
For primary bibliographic entry see Field 4C.
W76-12206

SEDIMENT DISCHARGE FROM HIGHWA CUT-SLOPES IN THE LAKE TAHOE BASI CALIFORNIA, 1972-74,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 4C.
W76-12279

MAP OF OVERDIP SLOPES THAT CAN A FECT LANDSLIDING IN ARMSTRONG COU TY, PENNSYLVANIA,
Geological Survey, Harrisburg, Pa.
For primary bibliographic entry see Field 7C.
W76-12300

ORGANIC MATTER LOSSES FROM FOU WATERSHEDS IN THE HUMID TROPICS,
East Carolina Univ., Greenville, N. C. Dept. Biology.
For primary bibliographic entry see Field 5B.
W76-12428

PHOSPHORUS LOSS BY STREAM TRAN PORT FROM A RURAL WATERSHED: QUA TITIES, PROCESSES, AND SOURCES,
Pennsylvania Univ., Philadelphia.
For primary bibliographic entry see Field 5B.
W76-12435

DISSOLVED NUTRIENT LOSSES IN STOR RUNOFF FROM FIVE SOUTHERN PI WATERSHEDS,
Agricultural Research Service, Oxford, MI Sedimentation Lab.
For primary bibliographic entry see Field 5B.
W76-12436

LIBRARY U. OF I. URBANA-CHAMPAIGN

LOT-DERIVED PARAMETERS FOR BASIN OMPUTATIONS,
gricultural Research Service, Beltsville, Md.
ydrograph Lab.
or primary bibliographic entry see Field 2A.
76-12438

ATER YIELD MODEL USING SCS CURVE UMBERS,
gricultural Research Service, Temple, Tex.
r primary bibliographic entry see Field 2A.
76-12522

WATER QUALITY MANAGEMENT AND PROTECTION

A. Identification Of Pollutants

DROLOGIC IMPACT OF BURNING AND AZING ON A CHAINED PINYON-JUNIPER E IN SOUTHEASTERN UTAH,
ah State Univ., Logan. Dept. of Range Science.
r primary bibliographic entry see Field 4C.
6-12153

DROGRAPHY AND PHYTOPLANKTON OF E COAST OF CASTELLON, FROM SEPMBER 1969 TO JANUARY 1971, (IN ANISH),
tituto de Investigaciones Pesqueras, Barcelona ain).
I. San Feliu, and Y. F. Munoz.
est Pesq. 39(1), p 1-36, 1975.

criptors: *Phytoplankton, Coasts, ydrography, Europe, Data collections, *Water perature, *Salinity, *Phosphates, *Oxygen, solved solids, Pigments, Primary productivity, utant identification, Secchi disk.
tifiers: Carbon-14, *Castellon Coast(Spain).

udy was carried out in station B (39 5' n, 00 21' F8ESP in the Oceanographic Commission of ESCO list, 16.8 miles off shore and to 78 m om depth. Data taken at several depths: temture, salinity, density, dissolved inorganic sphate, O2 and Secchi disc readings are tabul. Plant pigment and in situ productivity mead by the C14 method are also reported. Curs flow is usually parallel to the coast, but durn annual cycle, from 1-3 observations report -moving offshore. Salinity values above 38 were higher than all previous records, howthe concentration of dissolved phosphate was l; only 3 times the concentration of dissolved phate over the bottom was above 0.1 micro-g-l. The O2 saturation shows figures relatively t the end of cycle (Nov.). Primary production g the annual cycle (July 1969-June 1970) was gh as in 1962-63 and this is an agreement with igh values of salinity detected during the . Primary production as measured by the C14 od in situ was estimated by 100 g C/m2 yr. rigin of the water responsible for the fertility is region may be a local turnover in the Gulf n Jorge produced by the local wing (cierzo) n blows down the Ebro Valley and is similar mistral which induces mixing about 50 miles of the Gulf of Lions.--Copyright 1975, gical Abstracts, Inc.
12164

IES ON THE ALGAL COLONIZATION OF SAALE RIVER NEAR JENA: PART I. THE AREA AND ITS NON-BIOLOGICAL PROIES, (IN GERMAN),
Univ. (East Germany). Biology Section.
aune.
logica. 9(2), p 203-232, 1974.

Descriptors: *Algae, Rivers, Europe, *Municipal wastes, *Water sampling, Testing, Data collections, Physicochemical properties.
Identifiers: *Algal colonization, Jena, *Saale River(E Germany).

The physiography, hydrography, geology and humand population density of the area (in East Germany) are described and daily water flow and global radiation measurements from 1963-1968 are analyzed. Monthly tests were conducted with water samples from 2 points in which water temperature, actual O2 content, 48 h O2 consumption, NH4, NO2, NO3, orthophosphate, Cl, Ca and Mg levels, carbonate hardness, pH values and KMnO4 consumption were determined. Annual variations in these values and the effect of city waste on these factors were correlated.--Copyright 1975, Biological Abstracts, Inc.
W76-12166

APPARATUS FOR CONDITIONING UNLIMITED QUANTITIES OF FINISHED WATERS FOR ENTERIC VIRUS DETECTION,
National Environmental Research Center, Cincinnati, Ohio. Water Supply Research Lab.
W. F. Hill, Jr., E. W. Akin, W. W. Benton, C. J. Mayhew, and W. Jakubowski.
Appl Microbiol. 27(6), p 1177-1178, 1974.

Descriptors: Euteric bacteria, *Viruses, Microorganisms, *Pollutant identification, Apparatus, Instrumentation.
Identifiers: *Enteric virus, *Finished waters.

An apparatus was developed, constructed and tested for conditioning unlimited quantities of finished waters for enteric virus detection.--Copyright 1974, Biological Abstracts, Inc.
W76-12168

ENVIRONMENTAL FACTORS INFLUENCING ISOLATION OF ENTEROVIRUSES FROM POLLUTED SURFACE WATERS,
New Hampshire Univ., Durham. Dept. of Microbiology.
T. G. Metcalf, C. Wallis, and J. L. Melnick.
Appl Microbiol. 27(5), p 920-926, 1974.

Descriptors: *Isolation, *Viruses, *Enteric bacteria, Pollutant identification, *Texas, Treatment facilities, Bays, Environmental effects, Waste water treatment.
Identifiers: Enteroviruses, *Galveston Bay(Tex), Picornaviruses, Houston area(Tex).

The influence of water quality upon the concentration of virus on location was assessed in field studies conducted in the Houston ship channel, Galveston Bay, and Houston waste treatment plants in Texas. Clarification of polluted surface waters was accomplished with minimal loss of virus. Virus from clarified sewage effluents and saline waters was then adsorbed and concentrated on textile and membrane filter surfaces. Direct measurements of virus from large volumes of polluted surface waters under existing field conditions were then made using the virus concentrator equipment.--Copyright 1974, Biological Abstracts, Inc.
W76-12171

DISSOLVED NUTRIENT LOSSES IN STORM RUNOFF FROM FIVE SOUTHERN PINE WATERSHEDS,
Agricultural Research Service, Oxford, Miss. Sedimentation Research Lab.
For primary bibliographic entry see Field 5B.
W76-12172

EVALUATING THE MEMBRANE FECAL COLIFORM TEST BY USING ESCHERICHIA COLI AS THE INDICATOR ORGANISM,
Missouri Univ., Rolla. Life Science Lab.
J. B. Hufham.
Appl Microbiol. 27(4), p 771-776, 1974.

Descriptors: *Coliforms, E. coli, Evaluation, Filtration, *Bioindicators, *Membranes, *Filters, *Pollutant identification, Testing procedures.
Identifiers: *Enterobacter-Aerogenes, *Membrane filter method.

The fecal coliform membrane filter method (MFC) currently used in water pollution analysis was evaluated using 2 strains of E. coli, a known fecal coliform, as the indicator organism. A large relative error in the results obtained with this method was dependent upon the brand of membrane filter employed, the medium, and the temperature of incubation. MFC densities varied between 10 and 60% of the densities determined by total bacteria counts and total coliform counts performed at 35 degrees C. Due to the large relative error encountered, the MFC method cannot be recommended as an analytical tool for the laboratory enumeration of E. coli. The MFC method can be used at 35 degrees C for enumeration of E. coli and for differential counts of E. coli and Enterobacter aerogenes.--Copyright 1974, Biological Abstracts, Inc.
W76-12175

MERCURY IN WADERS FROM THE WASH,
Nature Conservancy, Abbots Ripton (England). Monks Wood Experimental Station.
J. L. F. Parslow.
Environ Pollut. 5(4), p 295-304, 1973.

Descriptors: *Mercury, Europe, *Pollutant identification, *Wading birds, Seasonal, Water pollution effects, Industrial wastes, Heavy metals.
Identifiers: Calidris-Alpina, Calidris-Canutus, Liver, Tringa-Totanus, Wash(England).

Concentrations of total Hg were determined in the livers of 73 waders (Limicolae) collected during Aug.-March on the Wash, eastern England, in order to obtain baseline data on levels of this element in birds living in a non-industrial and presumably lightly polluted estuarine area. In the knot (Calidris canutus), Hg levels were relatively low, about 1 ppm dry weight, in early autumn but increased through the winter until, by Feb.-March, they were about 10-20 times higher. On more limited or scattered data, the dunlin (C. alpina) and redshank (Tringa totanus) also showed much higher Hg levels in late winter compared with autumn. Hg accumulated in the liver during the winter months (When the birds are exclusively estuarine, mainly in temperature latitudes) is probably eliminated in summer (on mainly inland arctic and subarctic breeding grounds). The results are discussed in relation to the molt, movements and food of the main species. The biological significance of the concentrations found in the Wash waders is uncertain, but it is suggested that in industrial estuaries Hg levels in the same species may be very much higher and, by analogy with other species, could be having detrimental physiological effects.--Copyright 1974, Biological Abstracts, Inc.
W76-12176

THE CHEMISTRY OF 700 YEARS OF PRECIPITATION AT DYE 3, GREENLAND,
Army Cold Regions Research and Engineering Lab., Hanover, N. H.
J. H. Cragin, M. M. Herron, and C. C. Langway, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A014 970, $3.50 in paper copy, $3.00 in microfiche. Research Report 341, July 1975. 22 p, 5 fig, 9 tab, 30 ref, 1 append. NSF AG-212, AG-394.

Descriptors: *Precipitation(Atmospheric), *Snow, *Aerosols, *Chemical analysis, *Air pollution, Dusts, Fallout, Lead, Chemistry, Path of pollutants, Instrumentation, Analytical techniques, Ice, Sulfates, Sodium, Deposition(Sediments), Pollutants.

UNIV. OF ILL. URBANA-CHAMPAIGN

Identifiers: *Ice cores, *Dye-3(Greenland), *Surface snow, *Snow chemistry, Atmospheric transport, Ice sheets, Pollutant lead aerosols, Sea salt, Terrestrial dust, Pollutant sulfur aerosols, Greenland snow deposits.

Concentrations of sodium, potassium, magnesium, calcium, silicon, aluminum, lead and sulfate were measured in surface snow and in individual annual accumulation layers from a 373-m-deep ice core from Dye 3, Greenland, covering the time period from 1232 to 1971 A.D. Average background (pre-1840) concentrations in micrograms/liter are: Na, 12.9 + or - 9.3; K,2.2 + or - 2.1; Mg, 1.5 + or - 1.0; Ca, 4.8 + or - 2.4; Si, 12 + or - 6; Al, 3.3 + or - 1.4; Pb, 0.07 + or - 0.06; and S04, 56 + or - 22. Deviations are due mainly to the variability of the concentrations in the samples deposited over the stated time interval rather than analytical precision. Observed concentrations of sodium, potassium, magnesium, calcium, silicon and aluminum can be adequately explained by relative abundances of these elements in seawater and terrestrial dust. Late 19th century annual ice layers contain twice as much sulfate as pre-1840 deposits, reflecting the increased use of fossil fuels in the Northern Hemisphere. Lead concentrations in post-1955 snow deposits are more than an order of magnitude greater than pre-1840 baseline concentrations and are attributed to smelting and the increased use of lead alkyls in gasoline. (Henley - ISWS)
W76-12181

COMPARATIVE SURVIVAL OF INDICATOR BACTERIA AND ENTERIC PATHOGENS IN WELL WATER,
Montana State Univ., Bozeman. Dept. of Microbiology.
G. McFeters, G. K. Bissonnette, J. J. Jezeski, C. A. Thomson, and D. G. Stuart.
Appl Microbiol. 27(5); p 823-829, 1974.

Descriptors: *Bioindicators, Water wells, Bacteria, *Pathogenic bacteria, Coliforms, *Enteric bacteria, Water supply, Membranes, Pollutant identification, Water pollution, Salmonella, Streptococeus, Shigella.
Identifiers: Aeromonas-Sp, Flexneri, Vibrio-Cholerae.

The comparative survival of various fecal indicator bacteria and enteric pathogens was studied in a stable well water supply by using membrane chambers. There was more variation in the 29 coliform cultures and they died more rapidly, as a group, than the 20 enterococcus cultures that were examined. The comparative survival of the organisms tested follows: Aeromonas sp.> the shigellae (Shigella flexneri, S. sonnei, and S. dysenteriae) >fecal streptococci>coliforms = some salmonellae (Salmonella enteritidis serotype paratyphi A and D, S. enteritidis serotype typhimurium)>Streptococcus equinus>Vibrio cholerae>Salmonella typhi>Streptococcus bovis> Salmonella enteritidis serotype paratyphi B. S. bovis had a more rapid die-off than did S. equinus, but both had significantly shorter half-live than the other streptococci. The natural populations of indicator bacteria from human and elk fecal material declined similarly to the pure cultures tested, whereas the die-off of fecal streptococci exceeded the coliforms from bovine fecal material.--Copyright 1974, Biological Abstracts, Inc.
W76-12194

CARBON CONTENTS OF SURFACE AND UNDERGROUND WATERS IN SOUTH-CENTRAL MINNESOTA,
Minnesota Univ., Minneapolis. Dept. of Civil and Mineral Engineering.
W. J. Maier, R. G. Gast, C. T. Anderson, and W. W. Nelson.
Journal of Environmental Quality, Vol. 5, No. 2, p 124-128, April-June 1976. 1 fig, 6 tab, 23 ref.

Descriptors: *Pollutant identification, *Organic compounds, *Carbon, *Water quality, *Minnesota, *Biochemical oxygen demand, Analytical techniques, Organic matter, Water pollution, Surface runoff, Surface drainage, Water supply, Underground streams, Groundwater, Tile drains, Waste treatment, Tile drainage, Seasonal, Tiles.
Identifiers: Cottonwood River(Minn), Redwood River(Minn), *Total organic carbon, Carbon contents, South-central Minesota, *Organic carbon, *Inorganic carbon, Underground waters, Seasonal storage, Water quality characteristics, Carbon analysis, Beckman carbon analyzer, Drain tiles.

Data presented showed that the relatively ample supplies of water available from dependable stream flow in the upper Mississippi region will have to be supplemented on a seasonal basis by utilizing either surface or underground water storage. Such seasonal storage would affect the existing interflows of water between surface, subsurface, and groundwaters. It could also affect the temporal variations in chemical content of both surface runoff and storage waters. Analysis of the inorganic and organic C contents of surface, subsurface, and groundwater in the glaciated area of south-central Minnesota was conducted to determine the extent that seasonal interchange of surface and groundwaters may effect water quality. Organic C concentrations were 5-17, 1-6, and less than or equal to 2 mg/liter in surface, subsurface, and groundwaters, respectively, indicating that most organic materials are decomposed or retained in the upper layers of the soil with minimal transfer to groundwaters. The relatively high organic C concentration in surface waters was probably due to biodegradation of vegetation and animal tissues in stream channels or in top soil layers, marshes, and impoundments. Low organic C concentrations and relatively low flow volumes from tile drains indicated that their effect on organic C content of rivers in this area was minimal. (Henley - ISWS)
W76-12202

LEAD NITRATE POISONING IN THE CARP (CYPRINUS CARPIO L.):LOCALIZATION OF THE POLLUTANT IN THE BODY, (IN FRENCH),
Toulouse-3 Univ. (France). Laboratoire d'Ecophysiologi des Animaux.
M.-P. Gire, J. -F. Narbonne, and A. Serfaty.
Eur J Toxicol Environ Hyg. 7(2), p 98-103, 1974.

Descriptors: *Nitrates, *Lead, *Carp, *Spectrophotometry, *Pollutant identification, Poisons, Toxicity, Water pollution effects.
Identifiers: *Atomic absorption spectrophotometry, Lead nitrate.

The Pb content in various organs and tissues of the carp, a freshwater fish, was estimated during long-term experimental poisoning with lead nitrate. Samples were taken every wk for 6 wk. Pb was determined by atomic asorption spectrophotometry. Pb content varied considerably from tissue to tissue. The organs and tissues examined can be classified in this order of increasing Pb content: skeletal muscle, gonads, brain, heart, blood, liver and pancreas, bone, gills and abdominal kidneys.--Copyright 1975, Biological Abstracts, Inc.
W76-12251

PRINCIPLE OF A TECHNICAL DEVICE FOR THE STUDY OF TOXIC EFFLUENTS IN WATER POLLUTION, (IN FRENCH),
Toulouse-3 Univ. (France). Laboratoire d'Ecophysiologi des Animaux.
R. Labat, G. Dazarola, and A. Chatelet.
Bull Soc Hist Nat Toulouse. 109(1/2), p 163-170, 1973.

Descriptors: *Pollutant identification, *Toxicity, *Lethal limit, *Fish, *Respiration, Carp, Effluents, Water pollution effects, Perches, Instrumentation, Measurement
Identifiers: Perca-Fluviatilis, Tinca-Tinca, *Cardiac monitoring.

To quantify lethal concentrations of toxic materials, the lethal concentration for 50% of the test fishes was determined. The cardiac and respiratory frequencies of test fishes were studied while they were relatively free to swim in their medium. The species used were: Cyprinus carpio, Tinca tinca and Perca fluviatalis, armed with electrodes to follow the ECG and a little balloon to study respiration. These 2 parameters were regularly visualized and electronically registered, then analyzed. --Copyright 1975, Biological Abstracts, Inc.
W76-12255

AUTOMATIC DETERMINATION OF SULFATES BY AN IMPROVED NEPHELOMETRIC METHOD: APPLICATION TO THE DETERMINATION OF SO2 IN ATMOSPHERIC AIR AND OF SULFATES IN RAIN WATER, (IN FRENCH),
Institut d'Hygiene et d'Epidemiologie, Brussels (Belgium).
G. Verduyn, and A. Derouane.
Atmos Environ. 8(7), p 707-715, 1974.

Descriptors: *Pollutant identification, *Sulfates, *Rain water, Atmosphere, *Air pollution, Analytical techniques, Sulfur compounds, Automation, Oxides, Fluorometry.
Identifiers: *Nephelometric method, Sulfur dioxide(Air).

An automatic nephelometric method for the determination of low concentrations of sulfate is described. It permits the determination of concentrations as low as 0.1 micro-g cm-3. The sulfate ions are precipitated by barium perchlorate. Fifty samples can be analyzed per h. This method was developed for the determination of sulfur dioxide in air after absorption in diluted hydrogen peroxide. It is applicable to the determination of sulfate amounts in rain water. The equipment used is the Technicon Auto Analyzer connected with a monochromators spectrofluorimeter.--Copyright 1975, Biological Abstracts, Inc.
W76-12259

TRACE METALS AND POLLUTION OF THE BELGIAN COAST AND OF THE SCHELDT ESTUARY, (IN FRENCH),
Institut Royal des Sciences Naturelles de Belgique, Brussels. Lab. for Oceanographic Physics.
E. Peeters, J. Das, M. Mertens, and M. A. Castiaux.
Bull Inst R Sci Nat Belg Biol. 49(13), p 1-13, 1973.

Descriptors: *Trace elements, *Metals, *Pollutant identification, *Spectrophotometry, Estuaries, Coasts, Nitrates, Nutrients, Phosphates, Neutron activation analysis, Copper, Chromium, Iron, Lead, Zinc, Nickel.
Identifiers: Belgian coast, Gadus-merlangus, Pleuronectes-platessa, Trachurus-trachurus, *Atomic absorption spectrophotometry, North Sea, Scheldt estuary(Belgium).

Atomic absorption spectrophotometric assay of various metals (Cr, Cu, Fe, Zn, Pb and Ni) was done on water of the North Sea and the Scheldt estuary. For some metals a comparison is made between atomic absorption assay values and neutron activation measurements. Cu and Zn were assayed in the organs of 3 common species of fish in the North Sea (Pleuronectes platessa, Gadus merlangus and Trachurus trachurus). These results are compared with nutrient salt concentrations (nitrates, nitrites and phosphates) in the same waters. Zn and Cu values were in the normal range, but high values were observed for trace metals, such as Cr, Ce, Co and Hg.--Copyright 1975, Biological Abstracts, Inc.

76-12260

ETERMINATION OF BORON IN DRINKING ATER FROM KOSZALIN PROVINCE, (IN OLISH),
edical Academy, Poznan (Poland). Inst. of emistry and Analytics.
Grochmalicka, and E. Ponitka.
znan Tow Przyj Nauk Wydz Lek Pr Kom Farm. p 59-64, 1973.

scriptors: *Pollutant identification, Potable ter, *Boron, Colorimetry, Sea water intrusion, ter analysis, Water pollution sources, Ground-ter.
ntifiers: Colorimetric carmine method, szalin Province(USSR).

terminations of the B content in drinking water re performed in the province of Koszalin SSR) by a colorimetric carmine method. The ues obtained were from 0.012-0.035 mg b/l; the ger content in waters nearer the sea, the lower tent farther inland. The B content in sea water 0.637 mg b/l. The higher content of B in waters r the sea is possibly caused by penetration of water into the ground water.--Copyright 1975, logical Abstracts, Inc.
6-12261

LATION OF PARASITIC AND ROPHYTIC STRAINS OF BDELLOVIBRIO CTERIOVORUS FROM NATURAL TERS, (IN RUSSIAN),
skovskii Gosudarstvennyi Meditsinskii Institut USSR). Dept. of Public Hygiene; and Moskov- Gosudarstvennyi Meditsinskii Institut (I) SR). Dept. of General Hygiene.
. Doskina.
Sanit. 38(12), p 84-85, 1973.

criptors: *Isolation, *Parasites, E coli, cteria, *Viruses, *Pollutant identification.
tifiers: *Bdellovibrio-bacteriovorus, Lysis, rophytic parasites.

ins of B. bacteriovorus isolated by the method laque-forming units (using a lawn of growing erichia coli cells) are considered parasitic and e isolated by the method of spontaneous lysis pension of heat-killed E. coli) are saprophytic. transformation of parasitic strains to ophytic and vice versa is possible depending hether B. bacteriovorus is cultured with live ad host cells.--Copyright 1975, Biological Abts, Inc.
-12262

DAMENTAL STUDIES ON RESIDUE AND EMENT OF FORESTRY HERBICIDES IN , (IN JAPANESE),
nomiya Univ. (Japan). Coll. of Agriculture.
rimary bibliographic entry see Field 5B.
12263

HE METHODS OF DETERMINING THE ATE CONTENT OF WATER, AND THE CRIPTION OF A NEW PHOTOMETRIC HOD, (IN HUNGARIAN),
er-Kanalis. Komitats Hajdu-Bihar, Debrecen gary).
ai, K. Horvath, and G. Devai.
Biol Debrecina. 10/11, p 129-142, 1972.

iptors: *Pollutant identification, *Sulfates, analysis, *Photometry, Analytical ques, Methodology, Ions.

ew of previously proposed methods is given. proposed test, the sulfate ions in the test e are precipitated with a certain amount of n chloride. The residual quantity of barium, he addition of potassium chloride, is then netrically determined. If the amount of sulfate ions is determined in the dilutions of a standard solution whose sulfate content is already known, acurve, based on the extinction values, may be plotted and used to determine the sulfate content of test samples. Using this method, the upper limit is 200 mg/l if the test sample remains undiluted.--Copyright 1975, Biological Abstracts, Inc.
W76-12270

SURFACE WATER AVAILABILITY, PICKENS COUNTY, ALABAMA,
Geological Survey, Tuscaloosa, Ala.
For primary bibliographic entry see Field 4A.
W76-12280

WATER AVAILABILITY OF MONROE COUNTY, ALABAMA,
Geological Survey, Tuscaloosa, Ala.
For primary bibliographic entry see Field 4A.
W76-12281

QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1970: PARTS 12-16. NORTH PACIFIC SLOPE BASINS, ALASKA, AND HAWAII AND OTHER PACIFIC AREAS.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W76-12284

GROUND-WATER RESOURCES IN THE LOMPOC AREA SANTA BARBARA COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 2F.
W76-12288

PRELIMINARY ANALYSIS OF GEOHYDROLOGIC DATA FROM TEST WELLS DRILLED NEAR CHALK POINT, PRINCE GEORGES COUNTY, MARYLAND,
Geological Survey, Parkville, Md.
For primary bibliographic entry see Field 4B.
W76-12289

GEOLOGY AND WATER RESOURCES OF BROWN COUNTY, SOUTH DAKOTA--PART II: WATER RESOURCES,
Geological Survey, Huron, S. Dak.
For primary bibliographic entry see Field 4A.
W76-12290

CHEMICAL CHARACTERISTICS OF THE MAJOR THERMAL SPRINGS OF MONTANA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 2K.
W76-12293

GROUND-WATER RESOURCES OF LANE AND SCOTT COUNTIES, WESTERN KANSAS,
Geological Survey, Lawrence, Kans.
For primary bibliographic entry see Field 4B.
W76-12298

WINTER HYDROCHEMICAL CONDITIONS OF SMALL RIVERS IN THE POLESYE OF THE UKRAINIAN SSR (THE PRIPYAT BASIN), (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.
For primary bibliographic entry see Field 5C.
W76-12303

USE OF INFRARED SPECTROSCOPY FOR DETERMINING ENVIRONMENTAL POLLUTANTS, (IN RUSSIAN),
All-Union Labour Protection Research Inst. of the Central Council of Trade Unions, Leningrad (USSR).
V. A. Simonov, E. V. Nekhorosheva, and N. A. Zavorovskaya.
Gig Sanit. 10, p 71-72, 1974.

Descriptors: Infrared radiation, *Pollutant identification, *Spectroscopy, *Organic compounds, *Organic wastes, Oil wastes, *Chemical wastes, Industrial wastes, *Acids.
Identifiers: Carbon tetrachloride, Carboxylic acid, Exhaust gases, Lindane, Toluene diisocyanate, Aldehydes.

A brief review is presented of the literature on the use of IR spectroscopy in industrial-sanitary chemistry for analyzing noxious substances in air and wastewaters, such as carboxylic acids, aldehydes, alpha-methylstyrene, lindane, dibutyl phthalate, toluene diisocyanate, CCl_4, dichloroethan, exhaust gases, dispersed oil in wastewaters, etc.--Copyright 1975, Biological Abstracts, Inc.
W76-12307

HYDROGRAPHY AND PHYTOPLANKTON FROM THE BAY OF CADIZ, FROM JANUARY OF 1970 TO DECEMBER OF 1973, (IN SPANISH),
Instituto de Investigaciones Pesqueras, Cadiz (Spain). Laboratorio de Investigaciones Pesqueras.
R. Establier.
Invest Pesq. 39(1), p 225-248, 1975.

Descriptors: *Phytoplankton, *Biomass, Bays, *Hydrography, Europe, Water temperature, Salinity, Seston, *Spectrophometry, *Pollutant identification.
Identifiers: Plant pigments, *Bay of Cadiz(Spain).

Information was gathered regularly at 4 stations (Spain). Temperature, salinity, plant pigments and computed biomass are plotted. The results of spectrophotometric analysis of filtered seston are summarized.--Copyright 1975, Biological Abstracts, Inc.
W76-12309

FIRST DATA ON THE EXPERIMENTAL STUDY OF THE ZINC CYCLE IN THE LAGOON OF L'OLIVIER, (IN FRENCH),
Centre National de La Recherche Scientifique, Marseille (France). General Biology and Ecology Lab.
J. P. Baudin.
Vie Milieu Ser B Oceanogr. 24(1), p 59-80, 1974.

Descriptors: *Radioecology, *Zinc, Lagoons, Radioisotopes, *Tracers, Cladophora, Europe, Water temperature, Algae, Sediments, Pollutant identification.
Identifiers: Physa-Acuta, Sphaeroma-Hookeri, *Lagoon of L'Olivier(France).

Radioecological data were obtained from 3 groups of experiments with Zn 65 used as a tracer. The transfer of the Zn 65 from the water into the sediment was recorded for various temperatures in 3 stations of the lagoon. The fixation and the elimination of Zn 65 by algae of the genus Cladophora were studied. The transfer of the radioelement from this alga to the gastropod Physa acuta and to an isopod Sphaeroma hookeri Leach are discussed.--Copyright 1975, Biological Abstracts, Inc.
W76-12310

SANITARY AND HYGIENIC EVALUATION OF THE WATER OF THE UZHGOROD WATER SUPPLY SYSTEM, (IN RUSSIAN),
M. Y. Blyumberg, N. F. Grishchenko, and V. A. Sabov.
Gig Sanit. 4, p 102-103, 1974.

Descriptors: Rivers, *Public health, *Water supply, *Potable water, *Municipal water, Al-

kalinity, Chlorine, Oxidation, Ammonia, Nitrates, Nitrites, Chlorides, Sulfates, Hydrogen ion concentration, Water level, Rainfall, Water chemistry.
Identifiers: *Uzh River(USSR), Uzhgorod(USSR), Ukrainian-SSR.

The relation between the physicochemical and the hydrologic characteristics of the Uzh River, which supplies the city of Uzhgorod (Ukrainian SSR, USSR) with water, was studied. Transparency, alkalinity, residual Cl, oxidizability, ammonia, nitrates, nitrites, chlorides, sulfates and pH were analyzed. There was a close relation between the amount of rainfall, the water level in the river and the chemical composition of tap water.--Copyright 1975, Biological Abstracts, Inc.
W76-12313

HYGIENIC EVALUATION OF CERTAIN SURFACE-ACTIVE SUBSTANCES, COMPONENTS OF EFFLUENTS FROM TEXTILE INDUSTRY ENTERPRISES, (IN RUSSIAN),
Nauchno-Issledovatelskii Institut Epidemiologii i Mikrobiologii, Lvov (USSR).
E. A. Kordysh, and M. M. Ratpan.
Gig Sanit. 10, p 16-20, 1974.

Descriptors: *Pollutant identification, Effluents, Bioassay, Toxicity, Lethal limit, *Textiles, *Industrial wastes, Water pollution effects, Rodents, Public health.
Identifiers: *Stearoxa-6, *OC-20.

Sanitary-toxicologic features of 4 components of effluents stearoxa-6 and OC-20 compound (nonionogenic surface-active substances), alkamon OC-2 and A smoothing compound (cation-active complexes) are presented. In the discharge of these compounds into the natural waters their limiting property is the formation of foam. The standard permissible concentrations in surface waters of OC-20 compound, A smoothing compound, alkamon OC-2 and of stearoxa-6 comprise 0.1, 0.3; 0.5 and 1 mg/l, respectively. Guinea pigs, mice and rats were used for bioassays.--Copyright 1975, Biological Abstracts, Inc.
W76-12314

HYGIENIC SUBSTANTIATION OF THE MAXIMUM PERMISSIBLE CONCENTRATION OF HYDROGEN PEROXIDE IN SURFACE WATERS, (IN RUSSIAN),
Ministerstvo Zdravookhraneniya SSSR, Moscow. Institut Biofiziki.
V. I. Antonova, Z. A. Salmina, L. L. Latkina, A. P. Bukina, and N. I. Mishina.
Gig Sanit. 10, p 20-22, 1974.

Descriptors: Public health, *Lethal limit, Potable water, *Organoleptic properties, *Toxicity, *Municipal water, Rodents, Rabbits, Water supply, Pollutant identification.
Identifiers: Hydrogen peroxide.

The effect produced by H2O2 on the organoleptic properties of water, the sanitary state of surface waters and on warm-blooded animals under conditions of acute, subacute and chronic action were studied. The data make it possible to substantiate and recommend the maximum permissible concentration of H2O2 at a level of 0.1 mg/l for water bodies intended for municipal use. The limiting index of noxiousness is the sanitary toxicologic one. Rats and rabbits were studied.--Copyright 1975, Biological Abstracts, Inc.
W76-12315

SANITARY-CHEMICAL INVESTIGATION OF THE MIGRATION OF THE MONOMER FROM CAPROLON INTO WATER, (IN RUSSIAN),
Vsesoyuznyi Nauchno-Issledovatelskii Institut Gigieni i Toksikologii Pestitsidov, Kiev (USSR).
For primary bibliographic entry see Field 5B.
W76-12316

A NEW STANDARD 'DRINKING WATER' (GOST 2874-73) AND ITS SCIENTIFIC BASIS, (IN RUSSIAN),
Moskovskii Gosudarstvennyi Meditsinskii Institut (I) (USSR).
For primary bibliographic entry see Field 5G.
W76-12317

THE USE OF DIATOMS AND BACTERIA AS BIOLOGICAL INDICATORS OF POLLUTION IN STREAMS, (IN PORTUGESE),
Museu Rio-Grandense Ciencias Nat., Porto Alegre. (Brazil).
C. C. Medaglia, L. W. Aguiar, and M. Corte-Real.
Iheringia Ser Bot. 19, p 11-24, 1974.

Descriptors: *Diatoms, *Bacteria, *Bioindicators, Water pollution, South America, Streams, Pollutant identification.
Identifiers: *Brazil.

The results of studies using diatoms and bacteria as biological indicators of water pollution are presented. The brook studied was Arroio Diluvio (Porto Alegre-Southern Brazil), selected because of its oligosaprobic, mesosaprobic and polysaprobic conditions. International saprobic systems were used and a new system comparing occurrence of both diatoms and bacteria in the same area is proposed.--Copyright 1975, Biological Abstracts, Inc.
W76-12318

THE MERCURY CONCENTRATION IN EELS (ANGUILLA ANGUILLA) FROM THE ESTUARY OF THE GUADALQUIVIR RIVER AND 'ESTEROS' OF SALINES OF CADIZ BAY, (IN SPANISH),
Instituto de Investigaciones Pesqueras, Dadiz (Spain). Laboratorio de Investigaciones Pesqueras.
For primary bibliographic entry see Field 5C.
W76-12321

PRELIMINARY STUDIES OF ASBESTIFORM FIBERS IN DOMESTIC WATER SUPPLIES,
California Univ., Berkeley.
R. C. Cooper, and J. C. Murchio.
Available from the National Technical Information Service, Springfield, Va 22161 as ADA-011 855, $3.50 in paper copy, $3.00 in microfiche. Report AMRL-TR-74-125, Paper No. 5, December, 1974. p. 61-73. 3 fig., 7 ref.

Descriptors: Water quality, Laboratory tests, *Analytical techniques, *Water quality control, Water pollution sources, Water sources, *Water analysis, Water purification, *Asbestos, Mine wastes, Surface waters, Water supply, *Domestic water, *Pollutant identification, *Electron microscopy.
Identifiers: *Asbestiform fibers, Asbestos fiber analysis.

Nineteen water samples were collected in California, five from Houston, Texas, one from Wisconsin, and nine from Duluth, Minnesota, and were examined for their asbestiform fiber content. Analysis was by electron microscope. One can predict the occurrence of these matrials by understanding the geology of the watersheds and the industrial operations that are in process. Analysis of results from northern California water supplies indicate that water supplies exposed to large outcroppings of serpentine rock can contain considerable amounts of chrysoltile asbestos fibers. (Katz)
W76-12325

RELEASE OF THE CARCINOGEN BENZO(A) PYRENE FROM ENVIRONMENTALLY CONTAMINATED MUSSELS,
British Columbia Univ., Vancouver. Dept. of Zoology.
For primary bibliographic entry see Field 5B.
W76-12328

ACUTE EFECTS OF CADMIUM ON ICTALURUS PUNCTATUS (CATFISH),
Texas A and M Univ., College Station. Dept. of Veterinary Physiology and Pharmacology.
For primary bibliographic entry see Field 5C.
W76-12331

AN ACUTE SEPTICAEMIC DISEASE OF BROWN TROUT (SALMO TRUTTA) AND ATLANTIC SALMON (SALMO SALAR) CAUSED BY A PASTEURELLA-LIKE ORGANISM,
Norges Veterinarhoegskole, Oslo.
For primary bibliographic entry see Field 5C.
W76-12332

ACUTE TOXICITY OF PHOS-CHECK (TRADE NAME) 202 AND DIAMMONIUM PHOSPHATE TO FATHEAD MINNOWS,
Environmental Health Lab., Kelley AFB, Tex.
For primary bibliographic entry see Field 5C.
W76-12334

A REVIEW OF LITERATURE ON THE USE OF POTASSIUM PERMANGANATE (KMN04) IN FISHERIES,
Bureau of Sport Fisheries and Wildlife, Fayetteville, Ark. South Central Reservoir Investigations.
For primary bibliographic entry see Field 5C.
W76-12335

EFFECT OF CATTLE FEEDLOT WASTES UPON GROUND WATER--A COMMENTARY,
Texas Tech Univ., Lubbock. Dept. of Geosciences.
For primary bibliographic entry see Field 5B.
W76-12366

SAMPLING AND CALCULATION METHODS FOR DETERMINING QUANTITIES OF NITROGEN AND PHOSPHORUS IN WATERSHED RUNOFF,
Agricultural Research Service, Columbia, Mo.
R. E. Burwell, G. E. Schuman, R. F. Piest, W. E. Larson, and E. E. Alberts.
Presented at 1974 Winter Meeting of the American Society of Agricultural Engineers, December 10-13, 1974. Chicago, Illinois. 2 fig, 5 tab, 10 ref.

Descriptors: *Nitrogen, *Phosphorus, *Agricultural runoff, Sediments, Watersheds(Basins), *Sampling, *Path of pollutants, *Iowa, *Pollutant identification, Water pollution sources.

The nitrogen and phosphorus content of surface runoff from two watersheds in southwestern Iowa was analyzed for a 5-year period (1969-1973). Sampling and calculation procedures were evaluated for quantifying discharges of water-soluble NO3-N, NH4-N, and inorganic P and sediment-associated Kjeldahl N and NaHCO3-extractable P. The arithmetic mean nutrient concentration of samples collected during major runoff (greater than 10 cfs), multiplied by the quantity of water or sediment discharged, compared favorably with standard integration procedure for determining N and P discharge associated with surface runoff. (Skogerboe-Colorado State)
W76-12372

SELF-MONITORING PROCEDURES: BASIC LABORATORY SKILLS (164.6) STUDENT REFERENCE MANUAL,
Charles County Community Coll., La Plata, Md.
C. M. Schwing, W. T. Engel, J. H. Highby, and D. M. Wagner.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-244 91

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.00 in paper copy, $3.00 in microfiche. Environ-ental Protection Agency, Report No. EPA-430/1--007, May 1975. 107 p, 7 append. 900501.

escriptors: *Monitoring, *Effluents, *Pollutant entification, *Water pollution control, Water ality control, Laboratory tests, Laboratory uipment, Microbiology, Training, Education, raining.
entifiers: Outer Continental Shelf, Reference nuals.

sic Laboratory Skills is a course designed for e treatment plant operator or technician who is quired to monitor effluent discharges under a tional Pollutant Discharge Eliminating System PDES) permit and who had little or no previous perience in laboratory work. The manual to be ed by the student contains a review of basic thematics which includes the metric system, ole numbers, decimals, formulas and percent-e. The chemical laboratory sections contains ap-cations such as weighing techniques, use of oratory equipment, and preparation and stan-dization of reagents. An introduction to basic crobiological techniques is also included. nha-OEIS)
6-12377

ALUATION OF SOLID WASTE BALING D BALEFILLS. VOLUME I,
ph Stone and Co., Inc., Los Angeles, Calif.
ailable from the National Technical Informa- Service, Springfield, VA 22161 as PB-247 185, '5 in paper copy, $3.00 in microfiche. Environ-tal Protection Agency, Final Report, 1975. 213 4 fig, 49 tab. 68-03-0332.

criptors: *Solid wastes, *Monitoring, *Cost lysis, *Landfills, Pollution abatement, Mu-pal wastes, *Minnesota.
ntifiers: Baling, Balefills, St. Paul(Minn).

results of a one-year evaluation of a solid te high-density baling plant, transportation and ociated sanitary landfill operations of the erican Hoist and Derrick Company in St. Paul, nesota is reported. The work program con-d of four stages: (1) a five-day intensive moni-g program of the baling plant and bale trans-ation operations; (2) cost analysis during two s of plant operation; (3) a 12-month period of itoring a bale test cell constructed at the St. bale landfill; and (4) a nine-month period of itoring the bale sanitary landfill operation. cell monitoring included analyzing leachate gas samples, recording and analyzing tempera- trends, and settlement/expansion. Landfill toring included time and motion studies, fly gence studies, and odor, litter, dust, and vec-evaluation. Comparisons were made between ale landfill and normal environmental condi-. The feasibility of solid waste baling plants evaluated, and compared to milling and com- solid waste baling and milling systems. a-OEIS)
12381

T STUDIES ON THE ZOOPLANKTON OF LOTIC WATERS OF THE MIDDLE NA RIVER BASIN, (IN SPANISH),
rimary bibliographic entry see Field 5C.
12382

OLVED OXYGEN PROBE,
er and Porter Co., Warminster, Pa.
gnee).
rimary bibliographic entry see Field 5D.
2391

NIQUE FOR CONTINULUSLY ANALYZ-HE CONCENTRATION OF OZONE DIS-ED IN WATER,
er and Porter Co., Warminster, Pa.
nee).

For primary bibliographic entry see Field 5F.
W76-12405

REMOTE SENSING OF MARINE HYDROCARBON SEEPS,
Barringer Research Ltd., Rexdale (Ontario). (Assignee).
A. R. Barringer.
U. S. Patent No. 3,961,187, 3 p, 3 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 947, No 1, p 435, June 1, 1976.

Descriptors: *Patents, Water pollution sources, *Remote sensing, *Seepage, Oceans, Resources development, Bioluminescence, Optical properties, Oil industry, Exploration, *Oil pollution, Nutrients, *Organic compounds, *Pollutant identification.

A method and apparatus is provided for detecting the presence of dissolved hydrocarbon gases in the ocean remotely from an aircraft or a boat. It has been discovered that frequently gas seeps are accompanied by increased optical scattering in the water and also by an increased concentration of microorganisms growing in the water. The most common gas to seep from the sea floor is methane which provides an excellent nutrient for certain types of bacteria existing in the sea. These bacteria multiply rapidly and in turn provide an increased supply of nutrients for secondary growths of organisms that cannot be supported by methane along. An intense beam of light such as that generated by a laser is pointed downward from an over-flying aircraft. This beam of light preferably is pulsed, although a continuous source of light could be used with somewhat lesser effectivity. The wavelength of light chosen is in the blue or ultraviolet in order to achieve maximum sensitivity to scattering in the water and to stimulate bioluminescence in suspended microorganisms. The signal returned from the sea can be measured through a narrow band filter at the same wavelength as that of the emitting source to monitor turbidity and scattering. The bioluminescence emission can also be measured at a longer wavelength. An important feature is that surface and sub-surface reflections can be separated, because the surface reflections may be attributable to hydrocarbon slicks due to pollution, plankton, etc. instead of hydrocarbon seeps. (Sinha-OEIS)
W76-12411

ANALYTICAL THREE-DIMENSIONAL TRANSIENT MODELING OF EFFLUENT DISCHARGES,
Stone and Webster Engineering Corp., Boston, Mass.
For primary bibliographic entry see Field 5B.
W76-12433

CHEMICAL AND MICROBIOLOGICAL DEGRADATION OF MALATHION AND PARATHION IN AN ESTUARINE ENVIRONMENT,
Gulf Coast Research Lab., Ocean Springs, Miss. Microbiology Section.
For primary bibliographic entry see Field 5B.
W76-12437

OXYGEN ISOTOPE STUDIES ON SEA ICE IN THE GULF OF ST. LAWRENCE,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia). Atlantic Oceanographic Lab.
For primary bibliographic entry see Field 2C.
W76-12448

AN HISTORICAL PERSPECTIVE OF NUTRIENT INPUTS AND TROPHIC STATES AS DEDUCED FROM CAYUGA LAKE SEDIMENTS,
Cornell Univ., Ithaca, N. Y. Dept. of Natural Resources.

For primary bibliographic entry see Field 5C.
W76-12463

MULTIVARIATE ANALYSIS OF GEORGIA COASTAL PLAIN GROUNDWATERS,
Georgia Inst. of Tech., Atlanta. School of Geophysical Sciences.
For primary bibliographic entry see Field 2F.
W76-12466

COLOR CHARACTERIZATION OF KRAFT LINERBOARD DECKER EFFLUENT,
Institute of Paper Chemistry, Appleton, Wis.
H. S. Dugal, M. A. Buchanan, E. E. Dickey, and J. Swanson.
Paperi ja Puu, Vol. 58, No. 4a, Special issue, p 211-214, 217-218, 221-222, 225, April, 1976. 8 fig, 11 ref, 7 tab.

Descriptors: *Pulp wastes, *Color, Wastes, Industrial wastes, Water pollution sources, Lignins, Carbohydrates, Water quality, *Chromatography, Softwood, Hardwood, Effluents, *Pollutant identification.
Identifiers: *Deckers(Pulp thickeners), Kraft mills, Board mills, Indulin(Alkali lignin).

Decker effluents from a kraft linerboard mill using 98% softwoods and 2% hardwoods (Interstate Paper Corporation, Riceboro, Georgia) were investigated. Concentrated solutions of freeze-dried solids from the colored effluets were acidified to give acid-insoluble and acid-soluble components which were further fractionated by gel permeation chromatography. Most of the color bodies were of ligninlike character and seemed to comprise lignin degraded to various degrees. The acid-insoluble color bodies contained a high proportion of carboxylic and/or ketonic carbonyl groups conjugated with aromatic rings, whereas the acid-soluble color bodies contained a nonconjugated COOH group and appeared to be associated with carbohydrate material. All isolated color bodies were negatively charged and showed mobilities higher than Indulin (alkali lignin), indicating a higher density of negative charge per molecule. (Brown-IPC)
W76-12472

PHENOLIC AND CHLOROPHENOLIC OLIGOMERS IN CHLORINATED PINE KRAFT PULP AND IN BLEACH PLANT EFFLUENTS,
State Univ. of New York at Syracuse. Coll. of Environmental Science and Forestry.
For primary bibliographic entry see Field 5D.
W76-12475

AN IMPROVED IN SITU PH SENSOR FOR OCEANOGRAPHIC AND LIMNOLOGICAL APPLICATIONS,
California Univ., Los Angeles. Dept. of Geology.
For primary bibliographic entry see Field 7B.
W76-12479

A SUMMARY OF RECEIVING WATER DISSOLVED OXYGEN CONDITIONS BELOW PULP AND PAPER MILL LOCATIONS,
National Council of the Paper Industry for Air and Stream Improvement, Inc., New York.
For primary bibliographic entry see Field 5B.
W76-12480

DETERMINATION OF ALUMINUM IN PAPER MACHINE WHITE WATER BY POTENTIOMETRIC TITRATION WITH FLUORIDE ION,
Melbourne Univ., Parkville (Australia).
A. Homola, and R. O. James.
Analytical Chemistry, Vol. 48, No. 4, p 776-778, April, 1976. 2 fig, 16 ref, 3 tab.

Descriptors: *Aluminum, *Pulp wastes, *Water analysis, Water pollution sources, Calcium, Fluorides, Ions, Analytical techniques, *Volumetric analysis, *Pollutant identification.
Identifiers: *White water(Paper machines), *Potentiometric titration.

Aluminum in paper machine white water may be determined with less than 2% relative standard deviation by potentiometric fluoride titration, provided calcium (which may be a source of interference) is below 200 mg/liter. (Witt-IPC)
W76-12482

ANALYSIS OF HIGH-PURITY WATER AND ACIDS BY SPARK SOURCE MASS SPECTROMETRY,
National Research Council of Canada, Ottawa (Ontario).
A. Mykytiuk, D. S. Russell, and V. Boyko.
Analytical Chemistry, Vol. 48, No. 11, p 1462-1464, September, 1976. 1 fig, 5 ref, 3 tab.

Descriptors: *Water analysis, *Inorganic compounds, *Acids, *Mass spectrometry, Analytical techniques, Sulfur, Chlorine, Bromine, Boron, Laboratory equipment, Trace elements, Water pollution sources, Water chemistry, Water properties, Spectroscopy, Plastics, Pollutant identification.
Identifiers: Hydrochloric acid, Hydrofluoric acid, Nitric acid, Teflon, Vycor, Poly-4-methylpentene-1.

A convenient method for determining the trace inorganic impurities in high-purity water, hydrochloric, hydrofluoric, and nitric acids is described. The samples are concentrated in a Class 100 environment and the resulting residues are examined in a spark source mass spectrograph. Approximately 25 elements are usually detected above the concentration of 0.005 nanogram/gram (0.005 parts per billion). The technique permits the determination of sulfur, chlorine, bromine, and boron in water. Polypropylene and poly-4-methylpentene-1 beakers introduced less contamination than did those of linear polyethylene, Teflon, and Vycor. (Witt-IPC)
W76-12483

GAS-LIQUID CHROMATOGRAPHIC DETERMINATION OF 3-TRIFLUOROMETHYL-4-NITROPHENOL IN NATURAL WATERS,
Canada Centre for Inland Waters, Burlington (Ontario).
J. A. Coburn, and A. S. Y. Chau.
Journal Association of Official Analytical Chemists, Vol. 59, No. 4, p 862-865, July, 1976. 1 fig, 9 ref, 2 tab.

Descriptors: *Pesticides residues, *Water analysis, *Gas chromatography, Water pollution sources, Trace elements, Lampreys, Natural streams, Water chemistry, *Phenols, Great Lakes, Analytical techniques, Chromatography, Ion exchange, *Pollutant identification.
Identifiers: 3-Trifluoromethyl-4-nitrophenol, *Lampricides.

3-Trifluoromethyl-4-nitrophenol (TFM) is used for the control of sea lamprey in the Great Lakes. A procedure for the analysis of this compound in natural waters is described. The lampricide is extracted from acidified water samples on the macroreticular resin XAD-7 and eluted from the column with ethyl ether. The ether extract is dried, concentrated, and partitioned with potassium carbonate. TFM is acetylated in the aqueous alkaline solution and the acetate derivative is extracted into benzene for analysis by electron capture gas-liquid chromatrography. Recoveries of TFM from natural waters exceeded 90%, and as little as 0.01 microgram TFM can be detected in a 1 liter sample. (Witt-IPC)
W76-12486

BUBBLE TUBE: APPARATUS FOR DETERMINING RATE OF COLLECTION OF BACTERIA BY AIR BUBBLE RISING IN WATER,
State Univ. of New York at Albany. Atmospheric Sciences Research Center.
D. C. Blanchard, and L. D. Syzdek.
Limnol Oceanogr. 19(1), p 133-138, 1974.

Descriptors: *Bacteria, *Pollutant identification, Bubbles, Air, Apparatus, Data collections, Analytical techniques.
Identifiers: Serratia-Marescens, *Air bubbles, Bubble tube.

An air bubble rising through a bulk suspension of bacteria can be made to rise into a tube containing sterile water, which can then be cultured to determine the number of bacteria carried by the bubble. If the distance of bubble rise is varied, data are obtained from which both the attachment rate of bacteria to the bubble and the collection efficiency can be calculated. For a bubble of about 1-mm diameter rising through a suspension of Serratia marcescens, the collection efficiency is about 0.1%.--Copyright 1974, Biological Abstracts, Inc.
W76-12492

DETERMINATION OF CHLORINE DIOXIDE AND OTHER ACTIVE CHLORINE COMPOUNDS IN AQUEOUS SOLUTIONS (OZNACZANIE DWUTLENKU CHLORU ORAZ INNYCH AKTYWNYCH ZWIAZKOW CHLORU WROZTWORACH WODNYCH),
K. Ascik, and M. Glinska.
Przeglad Papierniczy, Vol. 32, No. 4, p 145-147, April, 1976. 1 fig, 8 ref.

Descriptors: *Water analysis, Water chemistry, Trace elements, Chlorine, Sodium arsenite, Hydrogen ion concentration, Water pollution sources, Electrodes, *Analytical techniques, *Pollutant identification, Volumetric analysis.
Identifiers: *Chlorine compounds, *Amperometric titration, *Chloramine, *Chlorine dioxide, *Chlorites, Hypochlorites.

The method described, intended primarily for the analysis of water containing low concentrations of chlorine compounds, makes it possible to determine active chlorine, chloramine, chlorine dioxide, and chlorite by 4 consecutive amperometric titrations with sodium arsenite solution. Active chlorine (free chlorine + hypochlorite + hypochloric acid) is titrated after chlorine dioxide has been eliminated by hydrolysis at pH 11, and the sample neutralized to pH 7. Titration under the same conditions but in the presence of KI gives the amount of free chlorine + chloramine. Titration at pH 7 without preliminary alkaline hydrolysis and in the presence of KI gives free chlorine + chloramine + 20% chlorine dioxide. And finally, free chlorine + chloramine + chlorine dioxide + chlorite are determined in a sample acidified to pH 2 and then neutralized to pH 7. The principles of the consecutive titrations are discussed, and a description is given of the analytical procedure and the apparatus used (a silver electrode immersed in a solution of NaCl in a glass tube, and a platinum electrode in the form of a wire wound about lower porous part of the tube). The method is rapid (about 20 min) and accurate. The error is less than 0.01 ppm. (Stapinski-IPC)
W76-12510

IMPLEMENTATION OF A LARGE SCALE WATER QUALITY DATA MANAGEMENT SYSTEM,
Carnegie-Mellon Univ., Pittsburgh, Pa.
For primary bibliographic entry see Field 5G.
W76-12521

ON THE POLLUTION OF WATER OF SOME RIVERS IN THE KASUMIGAURA LAKE BASIN, (IN JAPANESE),
Ibaraki Univ., Mito (Japan). Faculty of Agriculture.
For primary bibliographic entry see Field 5B
W76-12568

THE CHROMATOGRAPHIC METHOD OF DETERMINING INORGANIC AND ORGANIC MERCURY COMPOUNDS IN FRESH WATER (IN RUSSIAN),
Vsesoyuznyi Nauchno-Issledovatelskii Institut Gigieni i Toksikologii Pestitsidov, Kiev (USSR).
M. A. Klisenko, and A. M. Shmigidina.
Gig Sanit. 1, p 64-65, 1974.

Descriptors: *Mercury, *Chromatography, *Pollutant identification, Organic compounds, Inorganic compounds, Water analysis, Analytical techniques.
Identifiers: *Mercury compounds.

A chromatographic method for determining inorganic and organic Hg compounds in fresh water is discussed. The determination is based on isolating the Hg compounds in a low acid acetate buffer in the presence of composite III and potassium sulfocyanate, elimination of excess hitizone and chloroform and chromatography of the sample on a thin layer of silicate.--Copyright 1975, Biological Abstracts, Inc.
W76-12569

MICROBIOLOGICAL CHARACTERIZATION OF THE LACUSTRINE DEPOSIT LAID OPEN BY DRYING UP OF THE GREACA LAKE, (IN ROMANIAN),
Institutul de Studii si Cercetari Pedologice, Bucharest (Rumania).
For primary bibliographic entry see Field 2J.
W76-12571

GROWTH AND DISSIPATION OF PHYTOPLANKTON IN CHESAPEAKE BAY: RESPONSE TO A LARGE PULSE OF RAINFALL,
Johns Hopkins Univ., Baltimore, ,Md. McCollum Pratt Inst.
For primary bibliographic entry see Field 5C.
W76-12572

SEVERAL WATER CHEMISTRY DATA ON THE KNOWLEDGE OF THE SECTION OF THE DANUBE BETWEEN BUDAPEST AND TURNU SEVERIN (1645-930 KM) (DANUBIALIA HUNGARICA LXVII), (IN GERMAN),
Magyar Tudomanyos Akademia, Budapest. Station for Danube Research.
E. V. Kozma.
Ann Univ Sci Budap Rolando Eotvos Nominatae Sect Biol. 15, p 53-58, 1973.

Descriptors: *Water chemistry, Europe, Alkalinity, Hydrogen ion concentration, *Ions, Hardness(Water), *Pollutant identification, Rivers, *Path of pollutants, Water analysis.
Identifiers: Budapest, *Danube River, Danubialia Hungarica, Hungary, Kilometer, Romania, Severin, Turnu.

The pH, alkalinity, carbonate hardness, noncarbonate hardness, hydrogen carbonate ion, total hardness, C ions, Mg ions, SiO2, chloride ion, ammonium, nitrite, nitrite ions and O2 consumption were measured at 24 locations above and below the mouth of the Save (in Hungary and Romania), a tributary of the Danube, from July 1 to 24, 1971. The findings are compared with those obtained along the Save. Below the mouth of the Save, the ammonium ion content decreased to 1/3, the nitrite ion content practically doubled and the average values for nitrite ions and SiO2 rose slightly. The amount of chloride ion, in contrast with the Ca, Mg and hydrogen carbonate ions, also increased in a downstream direction.--Copyright 1975, Biological Abstracts, Inc.
W76-12574

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IE LINKAGE BETWEEN CHEMICAL POL-
JTION AND BACTERIOLOGICAL POLLU-
ON IN COASTAL ZONES. (RECHERCHE
UNE LIAISON ENTRE LA POLLUTION
IIMIQUE ET LA POLLUTION BAC-
RIOLOGIQUE DANS LES ZONES LIT-
)RALES),
mmissariat a l'Energie Atomique, Pierrelatte
rance).
r primary bibliographic entry see Field 5B.
76-12590

ME OBSERVATIONS REGARDING PEN-
CHLOROPHENOL LEVELS IN HAVER-
RD TOWNSHIP, PENNSYLVANIA,
lanova Univ., Pa. Dept. of Chemistry.
r primary bibliographic entry see Field 5B.
6-12591

TROGEN AVAILABILITY IN URBAN RU-
FF,
sconsin Univ., Madison. Water Chemistry Pro-
m.
primary bibliographic entry see Field 5B.
6-12596

INEXPENSIVE SAMPLER FOR STUDYING
E MICROBIOLOGY OF RIVER MUD,
ding Univ. (England). Dept. of Microbiology.
M. Webster.
nol Oceanogr. 19(1), p 159-161, 1974.

criptors: Microbiology, *Mud, *Sampling,
ers, *Pollutant identification, Bacteria, Fungi.
ntifiers: *River mud, *ATP determination.

mpler with a plastic internal lining was used to
in undisturbed cores of mud for ATP deter-
ations and total counts of bacteria and fungi;
her application of the internal lining was the
essful recovery of nylon mesh buried in the
.--Copyright 1974, Biological Abstracts, Inc.
-12599

OUNTERSTAINING TECHNIQUE FOR USE
ORTING BENTHIC SAMPLES,
erloo Univ., (Ontario). Dept. of Biology.
primary bibliographic entry see Field 2I.
-12606

ES OF MICRO-ORGANISMS IN AC-
ATED SLUDGE IN DEPENDENCE OF TEM-
ATURE AND NITRIFICATION (DIE
IEDLUNG DES BELEBTEN SCHLAMMES
ABHAENGIGKEIT VON TEMPERATUR
NITRIFIKATION),
Frenzel.
chrift fuer Wasser- und Abwasser-
chung, Vol. 9, No. 3, p 71-75, 1976. 10 fig, 12

riptors: *Waste water treatment, *Activated
e, *Treatment facilities, *Microscopy,
ozoa, Temperature, *Nitrification, *Pilot
s, *Pollutant identification.
ifiers: Rotatoria, Epistylis plicatilis, Arcella
ris, Lecane sp.

e from four activated sludge pilot plants was
scopically examined over a period of several
to test statistically the dependence on nitrifi-
and temperature of 10 protozoa and rota-
species. Epistylis plicatilis, Arcella vulgaris,
ecane species strongly depend on nitrifica-
and temperature in all types of treatment
. Other tested species showed no depen-
on nitrification and temperature. (Snyder-
)
2615

WASTEWATER TREATMENT - PHYSICAL AND CHEMICAL METHODS, (LITERATURE REVIEW),
Massachusetts Univ., Amherst. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W76-12629

PERSISTENCE OF VIRUS ON SEWAGE-IRRIGATED VEGETABLES,
Ohio Bureau of Foods, Cincinnati. Virology Branch.
For primary bibliographic entry see Field 5B.
W76-12634

SEPTIC TANK EFFICIENCY,
ADI Ltd., Fredericton (New Brunswick).
For primary bibliographic entry see Field 5D.
W76-12640

WATER-POLLUTION INSTRUMENTATION,
Weston (Roy F.), Inc., West Chester, Pa.
R. G. Thompson.
Chemical Engineering, Vol. 83, No. 13, p 151-154, June 21, 1976. 3 fig, 1 tab, 5 ref.

Descriptors: *Waste water treatment, *Treatment facilities, *Instrumentation, Equipment, *Monitoring, Measurement, Dissolved oxygen, Carbon, Organic compounds, Biochemical oxygen demand, Turbidity, Sampling, Chlorine, Chlorination, Aeration, Incineration, Dewatering, Filters, Digestion tanks, Temperature, Conductivity, Neutralization, *Pollutant identification.

Brief descriptions of water pollution control instrumentation and monitoring techniques are presented. Waste water treatment equipment discussed includes: neutralization sections, primary clarifiers, aeration basins, thickeners, digesters, dewatering devices, incinerators, filters, and chlorination systems. Monitoring techniques covered include: flow monitoring, pH monitoring, temperature monitoring, turbidity measurements, conductivity measurements, residual chlorine monitoring, dissolved oxygen monitoring, total organic carbon monitoring, and biochemical oxygen demand measurements. Composite sampling is also discussed. (Kreager-FIRL)
W76-12653

CONCENTRATIONS OF NITRIFYING BACTERIA IN SEWAGES, EFFLUENTS, AND A RECEIVING STREAM AND RESISTANCE OF THESE ORGANISMS TO CHLORINATION,
Rutgers - The State Univ., New Brunswick, N.J. Dept. of Environmental Science.
For primary bibliographic entry see Field 5D.
W76-12654

BULKING CONTROL MADE EASY - WITH HYDROGEN PEROXIDE,
FMC Corp., Princeton, N.J.
For primary bibliographic entry see Field 5D.
W76-12664

5B. Sources Of Pollution

FURTHER THERMAL ADDITION STUDIES AT CRYSTAL RIVER, FLORIDA WITH AN ANNOTATED CHECKLIST OF MARINE FISHES COLLECTED 1969-1971,
Florida Dept. of Natural Resources, St. Petersburg. Marine Research Lab.
For primary bibliographic entry see Field 5C.
W76-12163

STUDIES ON THE ALGAL COLONIZATION OF THE SAALE RIVER NEAR JENA: PART I. THE TEST AREA AND ITS NON-BIOLOGICAL PROPERTIES, (IN GERMAN),
Jena Univ. (East Germany). Biology Section.
For primary bibliographic entry see Field 5A.
W76-12166

DISSOLVED NUTRIENT LOSSES IN STORM RUNOFF FROM FIVE SOUTHERN PINE WATERSHEDS,
Agricultural Research Service, Oxford, Miss. Sedimentation Research Lab.
J. D. Schreiber, P. D. Duffy, and D. C. McClurkin.
Journal of Environmental Quality, Vol 5, No. 2, p 201-205, 2 fig, 6 tab, 21 ref.

Descriptors: *Nutrients, Water quality, Chemistry of precipitation, Baseline studies, *Nitrogen, *Phosphorus, *Cations, Cycling nutrients, *Storm runoff, Pine trees, *Mississippi, Forest watersheds, Coastal plains, Watersheds(Basins), Water analysis, Water chemistry, Pollutant identification, Path of pollutants.
Identifiers: *Nutrient net gain or loss, Nutrient flux, Coastal Plain watersheds.

Storm runoff from five reforested eroded watesheds in northern Mississippi (1.5 to 2.8 ha) was analyzed during the 1973 water year to determine the concentrations of soluble NO3-N, NH4-N, PO4-P, Ca, Mg, and K. Storm runoff was measured with 0.91-m H-flumes and samples were collected with a Coshocton wheel sampler. Analysis of precipitation which totaled 189 cm for the year, 40% above average, revealed that inputs of NO3-N, NH4-N, PO4-P, Ca, Mg, and K for the year were 3.12, 5.73, 0.07, 7.72, 3.03, and 4.98 kg/ha, respectively. Soluble nutrient losses in the storm runoff on a unit area basis were similar for the five watersheds. Average losses in storm runoff of soluble NO3-N, NH4-N, PO4-P, Ca, Mg, and K for the year were 0.32, 3.35, 0.04, 6.21, 3.05, and 3.31 kg/ha, respectively. As the annual storm runoff among the watersheds increased, the NO3-N losses also increased linearly. Data for individual storms indicated that a critical storm runoff value must be exceeded before the watersheds would exhibit a net loss of each nutrient. (Forest Service)
W76-12172

THE CHEMISTRY OF 700 YEARS OF PRECIPITATION AT DYE 3, GREENLAND,
Army Cold Regions Research and Engineering Lab., Hanover, N. H.
For primary bibliographic entry see Field 5A.
W76-12181

COMPARATIVE SURVIVAL OF INDICATOR BACTERIA AND ENTERIC PATHOGENS IN WELL WATER,
Montana State Univ., Bozeman. Dept. of Microbiology.
For primary bibliographic entry see Field 5A.
W76-12194

SEDIMENT YIELDS FROM ROADSIDES: AN APPLICATION OF THE UNIVERSAL SOIL LOSS EQUATION,
Wisconsin Univ., Green Bay. Science and Environmental Change.
For primary bibliographic entry see Field 4C.
W76-12206

THE TROPHIC STATE OF NORTH CAROLINA LAKES,
North Carolina Univ. at Chapel Hill. Dept. of Environmental Sciences and Engineering.
For primary bibliographic entry see Field 5C.
W76-12210

A LIMNOLOGICAL STUDY OF SPIRITWOOD LAKE, N. D., WITH SPECIAL EMPHASIS ON ITS WATER QUALITY, SEASONAL CYCLES

OF CHEMICAL NUTRIENTS PHYTOPLANKTON, ZOOPLANKTON AND PRIMARY PRODUCTION, PART II: CAUSES AND CONTROL OF ALGAL BLOOMS IN SPIRITWOOD LAKE, NORTH DAKOTA,
North Dakota State Univ., Fargo. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W76-12214

DEGRADATION OF DDT IN AN EVERGLADES MUCK AS AFFECTED BY LIME, FERROUS IRON AND ANAEROBIOSIS,
Agricultural Research Service, Baton Rouge, La.
J. F. Parr, and S. Smith.
Soil Sci. 118(1), p 45-52, 1974.

Descriptors: *DDT, *DDD, *Lime, *Iron, Respiration, Bacteria, Aerobic condition, Anaerobic conditions, *Degradation(Decomposition).
Identifiers: *Anaerobiosis, *Everglades muck.

DDT degraded slowly (less than < 5% recovered as DDD) in an Everglades muck amended with alfalfa meal and incubated for 4 wk under moist aerobic, moist anaerobic, and flooded anaerobic (unstirred) conditions. Degradation was more extensive in a flooded anaerobic environment subjected to continuous stirring where about 14% of the DDT was recovered as DDD. Liming the muck from pH 5.3 to 6.8 caused a greated conversion of DDT to DDD in the moist anaerobic environment than did the application of ferrous Fe, while the opposite was true for the flooded anaerobic environment. DDT degradation was greatest where muck was amended with alfalfa meal, lime and Fe2+ and followed the order of flooded anaerobic (stirred)>flooded anaerobic (unstirred)>moist anaerobic. Recovery of DDD from these environments was approximately 56, 32 and 10%, respectively. Lime caused a marked increase in bacterial populations in the anaerobic environments and was correlated with greater respiratory activity and increased DDT degradation. The application of Fe2+ particularly to flooded anaerobic muck samples appeared to substantiate a chemical mechanism for conversion of DDT to DDD. The extent of DDT degradation increased as the redox potential (Eh) decreased. --Copyright 1974, Biological Abstracts, Inc.
W76-12254

TRACE METALS AND POLLUTION OF THE BELGIAN COAST AND OF THE SCHELT ESTUARY, (IN FRENCH),
Institut Royal des Sciences Naturelles de Belgique, Brussels. Lab. for Oceanographic Physics.
For primary bibliographic entry see Field 5A.
W76-12260

DETERMINATION OF BORON IN DRINKING WATER FROM KOSZALIN PROVINCE, (IN POLISH),
Medical Academy, Poznan (Poland). Inst. of Chemistry and Analytics.
For primary bibliographic entry see Field 5A.
W76-12261

FUNDAMENTAL STUDIES ON RESIDUE AND MOVEMENT OF FORESTRY HERBICIDES IN SOIL, (IN JAPANESE),
Utsunomiya Univ. (Japan). Coll. of Agriculture.
M. Konnai, Y. Takeuchi, and T. Takematsu.
Bull Coll Agric Utsunomiya Univ. 9(1), p 95-112, 1974.

Descriptors: *Path of pollutants, *Pesticide residues, *Herbicides, Soils, *Adsorption, Inorganic compounds, Pollutant identification, Decomposing organic matter, Humus.

The movement and adsorption of these herbicides are dependent on the physical and chemical properties of the compounds. The movement was greater with inorganic compounds whose basic structures are charged negatively (ClO3-, NH2SO3-). The degree of translocation in the soil was varied due to such factors as soil character, humus, rainfall, intensity of rainfall and inclination of land. Resulting from these experiments, chlorate, sulfamin and fatty acid type herbides showed bigger movement and small with phenoxy, benzoic type herbicides. Esterized compounds revealed extremely little movement; they were firmly adsorbed on the soil surface. The herbicides of high water solubility with negative charge were highly correlated with the movement of soil water. With regard to the residue (decomposition and inactivation) determination, 6 compounds tested were inactivated completely 4-14 wk when applied at standard dosage. The inactivation tends to be rapid with DPA (2,2-dichloro propionic acid) and slow with TFP (2,2,3,3-tetrafluoro propionic acid) and AMS (ammonium sulfamate). As the dosages increase, the term of residue was relatively prolonged especially with TFP, TBA (2,3,6-trichloro benzoic acid) and 2, 4, 5-T. Factors responsible for decomposition and inactivation were organic matters, soil water, humidity and light.--Copyright 1975, Biological Abstracts, Inc.
W76-12263

SUCCESSION OF PLANKTON DIATOMS IN TOKYO BAY, (IN JAPANESE),
Tokyo Univ. (Japan). Ocean Research Inst.
For primary bibliographic entry see Field 5C.
W76-12268

QUANTITY OF HETEROTROPHIC BACTERIA ON SOME HIGHER PLANTS IN CARP PONDS, (IN RUSSIAN),
Ukrainian Research Inst. of the Fish Industry, Kiev (USSR).
A. F. Antipchuk.
Gidrobiol Zh. 10(1), p 63-64, 1974.

Descriptors: *Bacteria, *Carp, Fish hatcheries, Distribution, Path of pollutants, Vegetation, Microorganisms, Detritus, Ponds.
Identifiers: *Heterotrophic bacteria.

A determination of the abundance and distribution of heterotrophic saprophytic bacteria on the most common plants in carp ponds established high concentrations of bacteria in the zone of higher aquatic vegetation, which probably can be regarded as a result of the utilization of the intravital excretions of plants and detritus accumulating in the vegetation zone by the microorganisms. This assumption was confirmed by the fact that there were more microorganisms on the plant leaves than on the stems.--Copyright 1975, Biological Abstracts, Inc.
W76-12271

A STOCHASTIC MODEL FOR PREDICTING THE PROBABILITY DISTRIBUTION OF THE DISSOLVED-OXYGEN DEFICIT IN STREAMS,
Geological Survey, Reston, Va.
I. I. Esen, and R. E. Rathbun.
Available from Supt. of Documents, GPO, Washington, D. C. 20402, $1.55. Professional Paper 913, 1976. 50 p, 24 fig, 13 tab, 23 ref.

Descriptors: *Model studies, *Biochemical oxygen demand, *Streams, *Waste water(Pollution), *Stochastic processes, Monte Carlo method, *Dissolved oxygen, Oxygen sag, Reaeration, Self-purification, Waste assimilative capacity, Water pollution, Water quality control, Forecasting.

A random walk model was developed for predicting the distribution of the biochemical-oxygen-demand for points downstream from a waste source for a stream system in which the deoxygenation coefficient is a normally distributed random variable. A Monte Carlo technique for simulating a random walk process was used for estimating the distribution of the dissolved-oxygen deficit at downstream points in a stream in which both the deoxygenation and reseration coefficients are normally distributed random variables. Equations for approximating the mean oxygen deficit and the variance of the oxygen deficit were developed by expanding the basic equation of the stochastic model in a Taylor series. The frequency distributions of the oxygen deficit predicted by the stochastic model became flatter and skewed to the right as time of travel increased. The critical time of travel estimated from the stochastic model was larger than the critical time of travel computed from the deterministic model. The variance of the oxygen deficit at the critical time of travel was largest for small ratios of the reaeration and deoxygenation coefficients and smallest for the large ratios. (Woodard-USGS)
W76-12276

PROPOSED CROSS-FLORIDA BARGE CANAL: WATER-QUALITY ASPECTS, WITH A SECTION ON WASTE-ASSIMILATIVE CAPACITY,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 5G.
W76-12283

DISTRIBUTION OF TRACE ELEMENTS IN BOTTOM SEDIMENTS OF THE KIEV RESERVOIR UKRAINIA SSR, USSR, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.
E. P. Nakhshina.
Gidrobiol Zh. 10(6), p 13-17, 1974.

Descriptors: *Distribution, *Trace elements, *Reservoirs, Sediments, *Bottom sediments, Zinc, Copper, Cobalt, Manganese, Water storage, Statistical methods, Path of pollutants.
Identifiers: Ukrainian-SSR, Kiev reservoir(USSR).

The peculiarities of Mn, Zn, Cu and Co distribution in soils of the pelagic and littoral zones of the Kiev water storage basin (Ukrainian SSR, USSR) and factors determining this distribution were studied. The observed regularities were substantiated by statistical processing of the results.--Copyright 1975, Biological Abstracts, Inc.
W76-12305

DISTRIBUTION OF HETEROTROPHIC BACTERIA IN WATER AND BOTTOM DEPOSITS OF THE KREMENCHUG RESERVOIR IN RELATION TO THE INTENSITY OF DEVELOPMENT OF BLUE-GREEN ALGAE, (IN RUSSIAN),
Kiev State Univ. (USSR).
For primary bibliographic entry see Field 5C.
W76-12306

SANITARY-CHEMICAL INVESTIGATION OF THE MIGRATION OF THE MONOMER FROM CAPROLON INTO WATER, (IN RUSSIAN),
Vsesoyuznyi Nauchno-Issledovatelskii Institut Gigieni i Toksikologii Pestitsidov, Kiev (USSR).
V. O. Sheftel', and R. E. Sova.
Gig Sanit. 6, p 93-94, 1974.

Descriptors: Public health, *Plastics, Water temperature, Potable water, Chemical analysis, Hydrogen ion concentration, *Polymers, *Pollutant identification, *Path of pollutants.
Identifiers: *Caprolactam, *Caprolon, *Migration(Monomers).

The rate of migration of the monomer caprolactam was mathematically determined, in order to study the possibility of using caprolon articles in contact with drinking water. Migration was affected considerably by the water temperature and its contact time with the plastic. A change in pH of the water within limits permissible for drinking water does not affect migration of the monomer.--Copyright 1975, Biological Abstracts, Inc.

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/76-12316

HE USE OF DIATOMS AND BACTERIA AS IOLOGICAL INDICATORS OF POLLUTION I STREAMS, (IN PORTUGESE),
useu Rio-Grandense Ciencias Nat., Porto legre. (Brazil).
or primary bibliographic entry see Field 5A.
76-12318

RELIMINARY STUDIES OF ASBESTIFORM BERS IN DOMESTIC WATER SUPPLIES,
lifornia Univ., Berkeley.
or primary bibliographic entry see Field 5A.
76-12325

ELEASE OF THE CARCINOGEN BENZO(A) 'RENE FROM ENVIRONMENTALLY CON- AMINATED MUSSELS,
itish Columbia Univ., Vancouver. Dept. of ology.
P. Dunn, and H. F. Stich.
lletin of Environmental Contamination and xicology, Vol 15, No 4, p 398-401, 1976. 1 fig, 7 .

scriptors: *Absorption, *Bioindicators, ussels, *Organic compounds, *Mollusks, boratory tests, Water quality control, llutant identification, Invertebrates, Analytical hniques, Water quality.
ntifiers: *Benzo(a)pyrene release.

e occurrence of benzo(a)pyrene (B(a)P) in mus- s has been found to be a good indicator for the ntamination of bodies of water with polycyclic matic hydrocarbons. It is important to know residence-time of the compound in the species ler investigation. Mussels were collected from a ntaminated location and transferred to clean er and release of B(a)P was determined. The ount of B(a)P, initially 45 micrograms/kg wet ght, declined approximately exponentially over 6 weeks of the experiment, with an overall f-life of 16 days. The residence time of B(a)P in ssels makes these mollusks attractive as bioac- ulators in monitoring programs for this and er carcinogens. (Katz)
5-12328

IOENERGETICS-BASED MODEL FOR POL- TANT ACCUMULATION BY FISH. SIMULA- N OF PCB AND METHYL-MERCURY SIDUE LEVELS IN OTTAWA RIVER YEL- W PERCH (PERCA FLAVESCENS),
ional Research Council of Canada, Ottawa tario). Div. of Biological Sciences.
primary bibliographic entry see Field 5C.
-12329

TLE POLLUTION FROM THIS FEEDLOT.
primary bibliographic entry see Field 5G.
-12350

PING RUNOFF SAFE.
primary bibliographic entry see Field 5G.
-12351

NSPORT RATE OF COD THROUGH A POROUS STRATUM - MEASUREMENT DIFFUSIVITY IN CATTLE MANURE SOLU- N,
as State Univ., Manhattan. Dept. of Chemi- ngineering.
Choi, L. T. Fan, L. E. Erickson, and R. I. er.
sactions of the American Society of Agricul- Engineers, Vol. 14, No. 4, p. 720-726, July- st, 1971. 10 fig, 1 tab, 16 ref.

Descriptors: *Chemical oxygen demand, *Diffusivity, Water pollution, Percolation, Groundwater, Measurement, Mathematical models, *Farm wastes, *Path of pollutants.

The transport rate of materials through various soil strata is important for determining pollution potential of waterways by material introduced into the soil, at various distances from the water. A mathematical model and the equations derived from it are related to the transport of organic matter (expressed as chemical oxygen demand) through soil. The model used was packed bed, saturated with water and topped by a well mixed pool of homogeneous solution; both finite and infinite packed bed thicknesses are considered. Analytical expressions for concentration of a solute in the packed bed and in the homogeneous solution are given as a function of time, and of distance from the interface in the former case. Experimental data were obtained for a sucrose solution of known diffusivity in an experimental set-sup established in accordance with the model, and for a sterilized manure solution. (East Central)
W76-12352

BEEF FEEDLOTS - A POLLUTION PROBLEM,
Agricultural Research Service, Lincoln, Neb.
For primary bibliographic entry see Field 5G.
W76-12358

ANIMAL WASTE AND NITRATE MOVEMENT THROUGH SOIL,
Connecticut Univ., Storrs. Dept. of Agricultural Engineering.
J. A. Lindley, A. C. Dale, and J. V. Mannering.
Presented at the 67th Annual Meeting, American Society of Agricultural Engineers, Oklahoma State University, Stillwater, June 23-26, 1974, 17 p. 6 fig, 11 tab, 6 ref.

Descriptors: Groundwater movement, *Nitrates, *Leaching, *Denitrification, Loam, Soil moisture, Water pollution sources, *Farm wastes, Path of pollutants, Application rates, Waste disposal.
Identifiers: *Land disposal, Silt loam, Sandy loam.

An evaluation of high application rates of animal wastes to land becomes necessary as the number of animals per acre of land increases. The application rate must be controlled to prevent ground water degradation. A laboratory study was done to evaluate the effects of waste management on nitrate movement through soil. The fate of nitrate is dependent on various conditions. The most important are soil moisture and the presence of sufficient organic matter for microbial activity. Soil type might also affect nitrate movement. Leachates of very low nitrogen concentration can be produced even with waste application of 24.6 pounds of nitrate per acre-day. The amount of nitrogen lost increases with increasing available energy (C:N ratio). (Kehl-East Central)
W76-12362

SOIL CONSERVATION SERVICE, TEXAS TECH UNIVERSITY WORKSHOP COMMITTEE ON FEEDLOT WASTE.
Soil Conservation Service, Temple, Tex.
For primary bibliographic entry see Field 5G.
W76-12363

EFFECT OF CATTLE FEEDLOT WASTES UPON GROUND WATER--A COMMENTARY,
Texas Tech Univ., Lubbock. Dept. of Geosciences.
W. D. Miller.
In: Soil Conservation Service, Texas Tech University Workshop Committee on Feedlot Waste, Texas Tech University, Lubbock, July 28-29, 1971, 5 p. 3 fig.

Descriptors: *Feed lots, *Groundwater, *Seepage, Pollutants, Cattle, *Farm wastes, Water pollution control, Path of pollutants, Pollutant identification.

Several categories of potential ground water pollutants are listed. These include inorganic dissolved solids; organic dissolved solids; trace metals; pesticides, insecticides and herbicides; and bacteria and bacterially derived products. Along with the effects of these potential pollutants, the feedlot geology must be considered in discussing the effects of feedlot waste on ground water. Significant factors to be examined are: surface topography, soil permeability, bedrock lithology, structure and permeability, and depth of ground water. Thus, some land areas are more susceptible to ground water pollution than others. In Texas, cases of pollution have been documented in the Edwards Plateau, the Gulf Coast, and the High Plains. Further evaluation of the ground water pollution problem is needed. A study by Miller (1971) revealed that about 15-20 percent of the cattle feedlots in the Texas High Plains showed some evidence of seepage to the water table. Average nitrate, chlorides and dissolved solids concentrations are cited. (See also W76-12363) (Kehl-East Central)
W76-12366

SAMPLING AND CALCULATION METHODS FOR DETERMINING QUANTITIES OF NITROGEN AND PHOSPHORUS IN WATERSHED RUNOFF,
Agricultural Research Service, Columbia, Mo.
For primary bibliographic entry see Field 5A.
W76-12372

PREDICTED OIL SLICK MOVEMENT FROM VARIOUS LOCATIONS OFF THE NEW JERSEY-DELAWARE COASTLINE,
Coast Guard Research and Development Center, Groton, Conn.
I. M. Lissauer, and J. C. Bacon.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A019 019, $6.00 in paper copy, $3.00 in microfiche. Final Report No. USCG-D-137-75, June 1975. 132 p, 51 fig, 70 tab, 13 ref.

Descriptors: *Continental Shelf, Water quality control, *Oil spills, *Oil pollution, Water pollution sources, Resources development, *Meteorological data, *Environmental effects, *New Jersey, *Delaware, Drilling, Currents(Water), Coasts, Beaches, Shores, *Path of pollutants, *Forecasting.
Identifiers: *Outer Continental Shelf, *Deepwater ports, *New York Bight, Environmental impact, US East Coast.

Projections of the movement of oil slicks and their impact location along the shoreline of New Jersey and Delaware were determined from three potential deepwater port sites and three potential oil drilling sites. Average monthly wind speeds and directions and average monthly current patterns were used for predicting the oil slick movement. Probable areas of impact along the shoreline were indicated. (Sinha-OEIS)
W76-12376

MESOSCALE SPATIAL AND TEMPORAL VARIATIONS OF WATER MASS CHARACTERISTICS IN THE CALIFORNIA CURRENT REGION OFF MONTEREY BAY IN 1973-1974,
Naval Postgraduate School, Monterey, Calif.
For primary bibliographic entry see Field 2L.
W76-12386

MESOSCALE COMPONENT OF THE GEOSTROPHIC FLOW AND ITS TEMPORAL AND SPATIAL VARIABILITY IN THE CALIFORNIA CURRENT OFF MONTEREY BAY IN 1973-74,
Naval Postgraduate School Monterey, Calif.
For primary bibliographic entry see Field 2L.

W76-12387

USE OF THE METHOD OF MATHEMATICAL DESIGN OF EXPERIMENT IN SANITARY-CHEMICAL INVESTIGATIONS OF EPOXY COATINGS, (IN RUSSIAN),
Vsesoyuznyi Nauchno-Issledovatelskii Institut Gigieni i Toksikologii Pestitsidov, Kiev (USSR).
For primary bibliographic entry see Field 5G.
W76-12393

ORGANIC MATTER LOSSES FROM FOUR WATERSHEDS IN THE HUMID TROPICS,
East Carolina Univ., Greenville, N. C. Dept. of Biology.
M. M. Brinson.
Limnology and Oceanography, Vol. 21, No. 4, p 572-582, July 1976. 5 fig, 1 tab, 24 ref.

Descriptors: *Organic matter, *Runoff, *Humidity, *Tropical regions, Sediments, Suspended solids, Watersheds(Basins), Precipitation(Atmospheric), Rivers, Lakes, Sampling, Erosion, Drainage, Carbon, On-site investigations, Surveys.
Identifiers: *Guatemala, *Lake Izabel catchment basin, Seasonal hydrologic runoff, Organic carbon export.

Organic matter (OM) losses in runoff water were examined for four watersheds in Guatemala, ranging in size between 170 and 5,247 sq km. Total organic matter (TOM) concentrations for the largest river were highest (14.8-19.3 mg/liter) at the beginning of the wet season, due to an abrupt increase in particulate fractions. This initial flushing effect was followed by lower concentrations which had decreased to near dry season values (3.90-5.35 mg TOM/liter) 4 months later. Export of TOM was estimated to be between 5.4 and 12 g/sq m/yr for three of the four watersheds. The fourth, dominated by swamp forest, showed a higher maximum concentration (43.7 mg TOM/liter) and greater export, the latter partially attributable to flushing by floodwaters that overflowed an adjacent watershed. These data and those from studies in higher latitudes suggested a direct relationship between the quantity of TOM exported and runoff volume per unit area of watershed. A plausible explanation was that dissolved OM is the major form of OM in most running waters and varies less in magnitude than hydrologic runoff from one watershed to another. (Sims - ISWS)
W76-12428

ANALYTICAL THREE-DIMENSIONAL TRANSIENT MODELING OF EFFLUENT DISCHARGES,
Stone and Webster Engineering Corp., Boston, Mass.
G. T. Yeh, and Y. J. Tsai.
Water Resources Research, Vol. 12, No. 3, p 533-540, June 1976. 10 fig, 19 ref.

Descriptors: *Unsteady flow, *Dye releases, *Dye concentration, *Effluents, *Analytical techniques, *Turbulent flow, *Hudson River, *Mathematical models, Thermal pollution, Diffusion, Buoyancy, Density currents, Tidal waters, Equations, Pollutant identification, *Path of pollutants.
Identifiers: *Three-dimensional model, *Green's function, *Long Island Sound, Momentum.

A transient, three-dimensional turbulent diffusion equation describing the concentration distribution of a substance or heat in a time-dependent flow field was solved analytically. Two models were considered: one treated both the depth and the width of a water body as being finite, while the other dealt with finite depth but with infinite width. In the search for solutions, the method of Green's function was utilized to the optimum advantage. The solutions were developed for cases in which the velocity field can be described as any integratable function of time. For practical applications, the velocity was assumed to be the sum of a constant and a harmonic component. There were no limitations on the type of source conditions. Results were compared with field measurements and showed the models to be capable of simulating the dye distribution in tidal water bodies. The models should provide the engineering community with a quick and easy way of predicting the distribution of effluent discharges. They should obviate the need of using tedious and time-consuming numerical models, as occasions often arise in which such complicated models may not be warranted. (Lardner - ISWS)
W76-12433

AN ANALYSIS OF THE NUMERICAL SOLUTION OF THE TRANSPORT EQUATION,
Princeton Univ., N. J. Dept. of Civil Engineering.
W. G. Gray, and G. F. Pinder.
Water Resources Research, Vol. 12, No. 3, p 547-555, June 1976. 8 fig, 1 tab, 5 ref. NSF-AER74-01765.

Descriptors: *Mass transfer, *Dispersion, *Finite element analysis, *Numerical analysis, *Fourier analysis, Waves(Water), Convection, Computers, Equations, Mathematical studies, *Path of pollutants.
Identifiers: *Convective-dispersive equation, *Transport equation, Frontal smearing, Concentration overshoot, Finite difference methods.

The relative merits of numerical procedures used for the solution of the convective dispersive mass transport equation were examined in terms of frontal smearing and concentration overshoot. The testing for assessing the relative accuracy of some selected numerical procedures was based on a Fourier series representation of the solution to the governing equation and its discretized counterpart. Through a comparative examination of the analytically and numerically computed amplitude and speed of the Fourier components, the dispersive and dissipative properties of a numerical scheme were easily analyzed. The analysis indicated that the commonly observed phenomenon of overshoot of a concentration pulse was due to the inability of the numerical schemes to propagate the small wavelengths which are important to the description of the front. The numerical smearing of a sharp front was due to dissipation of these small wavelengths. The finite element method was found to be superior to finite difference methods for solution of the convective-dispersive equation. (Singh - ISWS)
W76-12434

PHOSPHORUS LOSS BY STREAM TRANSPORT FROM A RURAL WATERSHED: QUANTITIES, PROCESSES, AND SOURCES,
Pennsylvania Univ., Philadelphia.
A. H. Johnson, D. R. Bouldin, E. A. Goyette, and A. M. Hedges.
Journal of Environmental Quality, Vol. 5, No. 2, p 148-157, April-June 1976. 12 fig, 5 tab, 12 ref.

Descriptors: Phosphorus, *Phosphorus compounds, *Watersheds(Basins), *Sediment transport, *New York, *Phosphates, Analytical techniques, Fertilizers, Water pollution sources, Surface waters, Analysis, Chemical analysis, Water quality, Streams, Water pollution, Environmental effects, Analytical techniques, Algae, Land use.
Identifiers: *Phosphorus loss, *Stream transport, *Rural watersheds, Dissolved phosphorus, Particulate phosphorus, *Fall Creek(NY), Central New York, Nonsource point pollution, Stream sampling, Mineral constituents, Particulate forms.

Loss of dissolved and particulate phosphorus by stream transport was determined over a 20-month period for Fall Creek, a stream draining a predominantly rural watershed of 330 sq km in central New York. Samples were taken several times daily during most high flow periods and at 3 to 20 day intervals during low flow periods. Samples were usually processed within 4 hours since redistribution of P among chemical forms was rapid. Losses of P from the watershed per unit time varied by several orders of magnitude and 75% of the P loss occurred in the highest flow which occurred in 10% of the time. In reaches well downstream from major point source inputs, dissolved inorganic P concentrations were highest during storm events due to two processes: desorption of P accumulated in the bed sediment from point source inputs during low flow, and inputs from diffuse sources in surface runoff. Dissolved organic P concentrations were not correlated with flow. Approximately 20% of the dissolved P lost from the watershed was derived from diffuse sources associated with farming, 45% was derived from natural geochemical processes, and 35% from point source inputs. Less than 1% of the P applied to the landscape in chemical fertilizer and manure was lost from the watershed in dissolved form. (Henley - ISWS)
W76-12435

DISSOLVED NUTRIENT LOSSES IN STORM RUNOFF FROM FIVE SOUTHERN PINE WATERSHEDS,
Agricultural Research Service, Oxford, Miss. Sedimentation Lab.
J. D. Schreiber, P. D. Duffy, and D. C. McClurkin.
Journal Environmental Quality, Vol. 5, NO. 2, p 201-205, April-June 1976. 2 fig, 6 tab, 21 ref.

Descriptors: Nutrients, *Storm runoff, *Water quality, *Cycling nutrients, *Nutrient removal, Nitrates, Phosphats, Chemical analysis, Leaching, Runoff, Water properties, *Watersheds(Basins), Rain, Precipitation(Atmospheric), Rainfall-runoff relationships, Cations, Baseline studies.
Identifiers: *Nutrient losses, *Southern pine watersheds, Northern Mississippi, Watershed studies, *Nutrient flux, *Coffeeville(Miss), Nutrient net gain or loss, Forested lands, Dissolved nutrients, Mineral constituents, Forest productivity, Coastal plain watersheds, Nitrate nitrogen, Ammonium nitrogen, Orthophosphates.

Storm runoff from five reforested eroded watersheds in northern Mississippi (1.5 to 2.8 ha) was analyzed during the 1973 water year to determine the concentrations of soluble NO3-N, NH4-N, PO4-P, Ca, Mg, and K. Storm runoff was measured with 0.91-m H-flumes and samples collected with a Coshocton wheel sampler. Analysis of precipitation which totaled 189 cm for the year, 40% above average, revealed that inputs of NO3-N, NH4-N, PO4-P, Ca, Mg, and K for the year were 3.12, 5.73, 0.07, 7.72, 3.03, and 4.98 kg/ha, respectively. Soluble nutrient losses in the storm runoff on a unit area basis were similar for the five watersheds. Average losses in storm runoff of soluble NO3-N, NH4-N, PO4-P, Ca, Mg, and K for the year were 0.32, 3.35, 0.04, 6.21, 3.05, and 3.31 kg/ha, respectively. As the annual storm runoff among the watersheds increased, the NO3-N losses also increased linearly. Data for individual storms indicated that a critical storm runoff value must be exceeded before the watersheds would exhibit a net loss of each nutrient. (Henley-ISWS)
W76-12436

CHEMICAL AND MICROBIOLOGICAL DEGRADATION OF MALATHION AND PARATHION IN AN ESTUARINE ENVIRONMENT,
Gulf Coast Research Lab., Ocean Springs, Miss. Microbiology Section.
W. W. Walker.
Journal Environmental Quality, Vol. 5, No. 2, p 210-215, April-June, 1976. 3 fig, 6 tab, 26 ref.

Descriptors: *Pesticides, *Chemical degradation, *Microbial degradation, *Estuarine environment, *Organophosphorus pesticides, *Salinity, Chemical properties, Sea water, Analytical techniques, Sediments, Bacteria, Gas chromatography, Water pollution, Organic pesticides, Phosphorus com-

UNIVERSITY OF ILLINOIS-URBANA-CHAMPAIGN

unds, Path of pollutants, Pollutant identification, *Mississippi.
entifiers: *Organophosphorus insecticides, falathion degradation, *Parathion degradation, linity effects, Pesticide chemicals, *Davis you(Miss), Estuarine waters, Environmental zards, Malathion, Parathion, Analytical ocedures, Microbiological degradation, alathion abatement, Parathion abatement.

alation was essentially completely degraded dur- 18 days incubation in sterile and nonsterile ter, while respective paration losses ranged m 16 to 23% after 40 days. Malathion abatement s in direct proportion to increasing salinity, ile parathion was quite persistent, even in high inity (25 parts per thousand) water. Microorgan- is capable of degrading malathion and parathion re isolated from insecticide-enriched sediment. ur bacteria isolated from malathion-enriched iment readily degraded malathion, one to lathion half-ester and another to malathion arboxylic acid through the half-ester inter- diate, and three bacteria isolated from athion-enriched sediment were efficient in athion metabolism. One bacterium isolated m parathion-enriched sediment was capable of rading malathion to the diacid through the half- er intermediate. (Henley-ISWS)
6-12437

ME OBSERVATIONS ON THE CON- MINATION OF THE COASTAL WATERS OF E CITY OF CUMANA, (IN SPANISH),
versidad de Oriente, Cumana (Venezuela). . of Oceanography.
A-Fernandez.
Inst Oceanogr Univ Oriente Cumana. 12(1), p 2, 1973.

criptors: Europe, *Water pollution sources, sts, *South America, *Coliforms, reptococcus, Salmonella, *Industrial wastes, age, Canneries.
tifiers: *Cumana(Venezuela).

yr study was conducted to determine the ee of pollution in the coastal area near ana, Venezuela. Severe pollution problems e found in localized areas. Pollution sources e identified as the discharges, close to the e line, of raw sewage and wastes from fish- eries. Another contributing source was the zanares River flowing through populated s before reaching the sea. Coliform counts hed over 108/100 ml and Streptococcus over 8 4/100 ml. The presence of Salmonella in the tal waters was also investigated intermit- y. --Copyright 1975, Biological Abstracts, Inc.
-12467

LUATION OF PROPOSED SEWAGE DGE DUMPSITE AREAS IN THE NEW K BIGHT.
onal Oceanic and Atmospheric Administra- Boulder, Colo. Marine Ecosystems Analysis ram Office.
rimary bibliographic entry see Field 5E.
12469

OR CHARACTERIZATION OF KRAFT RBOARD DECKER EFFLUENT,
ute of Paper Chemistry, Appleton, Wis.
rimary bibliographic entry see Field 5A.
12472

D FIBER BOARDS: RAW MATERIALS, BRATING CONDITIONS, WASTE WATER FIBERPLATER RASTOFF -- BRERINGSBETINGELSER -- AVLOP- N),
egian Pulp and Paper Research Inst., Oslo.
dland, and K. Helge.
Skogindustri, Vol. 30, No. 5, p 114-117, 1976. 12 fig, 3 ref. English summary.

Descriptors: *Waste water(Pollution), *Pulp waste, Europe, Foreign research, Pine trees, *Wood wastes, Biochemical oxygen demand, Hardwood, Softwood, Heat treatment, Time, Bark, Fibers(Plant), Pressure, Effluents.
Identifiers: *Fiberboards, *Norway, Spruce trees(Picea), Building boards, Fiber yield, *Defibration.

The Norwegian Paper Research Institute (PFI) in cooperation with Norsk Wallboard A/S. (Norway) has been investigating the effects of fiberizing conditions (8, 10, and 12 kp/sq cm pressure), pretreatments (3.5 to 7 min preheating times), and wood species (barked and unbarked spruce, unbarked pine, and hardwood slabs) on the fiber yield and the effluent BOD load in the production of pulp for building boards. A decrease in defibrator pressure from 12 to 8 kp/sq cm increased the fiber yield 4-5% for softwood and 6-7% for hardwood. Simultaneous shortening of preheating time increased yields 7-9%. Effluent BOD was clearly related to fiber yield. Hardwoods caused slightly greater BOD loads than did softwoods, but no significant differences were observed between spruce and pine or between bark and wood fibers, although bark contributes proportonately more to BOD because it reduces the fiberized yield. (Brown-IPC)
W76-12476

A SUMMARY OF RECEIVING WATER DISSOLVED OXYGEN CONDITIONS BELOW PULP AND PAPER MILL LOCATIONS,
National Council of the Paper Industry for Air and Stream Improvement, Inc., New York.
M. Iacoboni, and R. O. Blosser.
Special Report No. 76-03, 10 p, March, 1976. 1 tab.

Descriptors: *Dissolved oxygen, Natural streams, *Pulp wastes, Water pollution effects, Wastes, Industrial wastes, Water pollution sources, Water analysis, Streamflow, Water quality, Water pollution, Waste assimilative capacity, *Path of pollutant, Monitoring, Pollutant identification.

An analysis was made of dissolved oxygen data for 77 monitoring stations below 80 pulp and paper mills during the low-flow months in the years 1954, 1964, 1969, and 1974. There was a significant increase in dissolved oxygen level between 1969 and 1974. In 82% of the cases the dissolved oxygen met or exceeded the water quality standards in 1974. In the cases where the levels were significantly less than the standard, the mill effluent comprised all or the bulk of the stream flow. (Buchanan-IPC)
W76-12480

MICROBIOLOGICAL TRANSFORMATION OF CARBON NITROGEN, SULFUR, IRON, PHOSPHORUS AND CALCIUM COMPOUNDS IN LAKE RESERVOIRS, (IN POLISH),
Polish Association of Sanitary Engineering and Technology, Warsaw.
For primary bibliographic entry see Field 5C.
W76-12494

PHOSPHATE RELEASE AND SORPTION BY LAKE MOHEGAN SEDIMENTS,
City Coll., New York. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5C.
W76-12512

A EUTROPHICATION MODEL FOR A LAKE,
Royal Danish School of Pharmacy, Copenhagen.
For primary bibliographic entry see Field 5C.
W76-12515

LARGE SCALE SYSTEMS APPROACH TO ESTUARINE WATER QUALITY MODELLING WITH MULTIPLE CONSTITUENTS,
Texas Univ. at Austin. Dept. of Electrical Engineering.
B. R. Penumalli, R. H. Flake, and E. G. Fruh.
Ecological Modelling (International Journal on Ecological Modelling and Engineering and Systems Ecology), Vol. 2, No. 2, p 101-115, June 1976. 6 fig, 4 tab, 11 ref, 1 append.

Descriptors: *Estuaries, *Water quality, *Mathematical models, *Simulation analysis, Nitrogen cycle, Ecosystems, Environment, Management, Equations, Systems analysis, *Texas, Bays, *Model studies, *Path of pollutants.
Identifiers: Matrix model, *Corpus Christi Bay(Texas), Concentration distribution, Steady state solution.

A matrix model for simulating concentration distributions of water quality constituents with coupled reactions in an estuary is developed from a large scale systems approach. The model is an approximation to the set of coupled partial differential equations describing the process. This steady state approximation is formulated as a large algebraic system consisting of coupled subsystems. The large algebraic system is solved by an efficient iterative method. Results utilizing actual field data are presented for the nitrogen cycle with five constituent forms of nitrogen for Corpus Christi Bay, Texas. Simulated and observed concentrations are compared. (Bell-Cornell)
W76-12517

AN INTERDISCIPLINARY MATHEMATICAL MODEL APPLIED TO THE SOUTHERN BIGHT OF THE NORTH SEA,
Liege Univ. (Belgium). Institut de Mathematique.
J. C. J. Nihoul.
Ecological Modelling (International Journal on Ecological Modelling and Engineering and Systems Ecology), Vol. 2, No. 1, p 3-17, March 1976. 5 fig, 1 tab, 12 ref, 1 append.

Descriptors: *Ecosystems, *Mathematical models, *Management, *Simulation analysis, Food chain, Pollutants, Water quality, Fishing, Fish, Heavy metals, Storm surge, Tides, Coasts, Chemical analysis, Estuaries, Systems analysis.
Identifiers: *Marine ecosystem, *Southern Bight(Belgium), Prediction, Residual circulation model, Dispersion models, *Interdisciplinary model, Transfer functions, *North Sea(Southern Bight).

An interdisciplinary mathematical model based on a 5-year survey of the Southern Bight is presented; it is shown how, through a hierarchy of management-oriented submodels, a predictive description of the system can be given from tides, storm surges, residual circulation and dispersion mechanisms to the dynamics of ecosystems and the transfer of pollutants through the food chain. By providing estimates of the anticipated fish population and level of pollution, the model can assist Public Health decisions. The model can set up for management the problem of optimizing, subject to economical constraints, the tolerable inputs and the locations of sources of pollution, coastal outfalls and sea dumpings. The model integrates the contributions of more than a hundred research workers and technicians who collaborated with the Belgian National Environment Project during a 5-year period. (Bell-Cornell)
W76-12518

DOCUMENTATION OF SELECTED CONSTRUCTS AND PARAMETER VALUES IN THE AQUATIC MODEL CLEANER,
National Oceanic and Atmospheric Administration, Ann Arbor, Mich. Great Lakes Environmental Research Lab.
For primary bibliographic entry see Field 5C.
W76-12519

POLLUTIONAL ANALYSIS OF COMBINED SEWER SYSTEMS,
Norsk Institutt for Vannforskning, Blindern.
For primary bibliographic entry see Field 5D.

W76-12530

ON THE POLLUTION OF WATER OF SOME RIVERS IN THE KASUMIGAURA LAKE BASIN, (IN JAPANESE),
Ibaraki Univ., Mito (Japan). Faculty of Agriculture.
Y. Takamura, S. Suzuki, T. Masaki, O. Kodama, and Y. Asada.
Sci Rep Fac Agric Ibaraki Univ. 21, p 53-63, 1973.

Descriptors: *Pollutant identification, Path of pollutants, *Rivers, Lakes, *Water pollution sources, *Industrial wastes, *Municipal wastes, Irrigation, Water quality control, Dissolved oxygen, Chemical oxygen demand, Ions, Bacteria, Coliforms, Conductivity.
Identifiers: Eutrophication causes, *Kasumigaura Lake basin(Japan).

The water of Sakura River (R), Sakai R., Shinkawa R., Seimei R. and Hanamuro R. which flow into Tsuchiura bay of the lake Kasumigaura, was quantitatively analyzed from April 1971-April 1973 to determine the degradation of water quality of rivers relating to the eutrophication of the lake. Chemical oxygen demand (COD), NH4+, NO2-, Cl-, Zn++, Cd++ ions, dissolved oxygen (DO), coliform bacteria, etc., were analyzed together with electric conductance, temperature and pH. The pollution of Sakai R. was caused by industrial waste waters from metal product plants; Hanamuro R. by food product plants; and Shinkawa R. by urban sewage. The pollution of Sakura river was relatively lower. In the lake and the river with the wider drainage basin (Sakura R.) concentrations of COD and NH4+ ion increased in spring and summer and decreased in fall and winter. In rivers with narrow drainage basins near urban environments such a seasonal change of the water quality was not observed. In those rivers rainfall affected the water quality. The water quality was remarkably affected by the supply of irrigation water from the lake Kasumigaura in spring and summer. Irrigation water caused a decrease in bacterial numbers of Hanamuro and Sakura rivers.--Copyright 1975, Biological Abstracts, Inc.
W76-12568

SEVERAL WATER CHEMISTRY DATA ON THE KNOWLEDGE OF THE SECTION OF THE DANUBE BETWEEN BUDAPEST AND TURNU SEVERIN (1645-930 KM) (DANUBIALIA HUNGARICA LXVII), (IN GERMAN),
Magyar Tudomanyos Akademia, Budapest. Station for Danube Research.
For primary bibliographic entry see Field 5A.
W76-12574

HYDROCARBON RESIDUES IN IVORY COAST WATERS,
For primary bibliographic entry see Field 5C.
W76-12579

THE LINKAGE BETWEEN CHEMICAL POLLUTION AND BACTERIOLOGICAL POLLUTION IN COASTAL ZONES. (RECHERCHE D'UNE LIAISON ENTRE LA POLLUTION CHIMIQUE ET LA POLLUTION BACTERIOLOGIQUE DANS LES ZONES LITTORALES),
Commissariat a l'Energie Atomique, Pierrelatte (France).
M. Archimbaud, and C. Trouve.
Water Research, Vol. 10, No. 3, p 225-229. 3 fig, 2 tab, 10 ref.

Descriptors: Water pollution, *Water quality control, *Coliforms, Chemical analysis, *E. coli, *Bacteria, *Ammonia, *Detergents, Sewage effluents, Sampling, *Pollutant identification, *Path of pollutants.
Identifiers: *Marseille(France), *Bacteriological analysis.

Analysis of water samples taken from 4 locations near Marseille, France, in the Etange de Berre (Baie de Vaine, Baie de St. Chamas) and in the Mediterranean Sea near the Marseille Sewer at Cortiou is reported. The study was undertaken in order to view correlations between pollution as measured by bacteriological and chemical indicators, particularly in waters which are meant for swimming. Since chemical analysis is the faster of the 2 techniques, it would be possible to use these measures to quickly and precisely survey areas of possible pollution. Samples were taken (146 in total) and sent to a laboratory for bacteriological analysis and chemically analysed in a mobile laboratory at the sampling site. For the former, the number of coliform bacteria and escherichia coli were counted and for the latter detergent anions and ammonia were measured. Visual analysis of the figures obtained revealed that an attempt to correlate the figures mathematically would be statistically biased because of the form of the distributions. Each of the measures was divided into 3 sections: weak, medium and strong concentrations. This revealed interesting results. A first estimation is that for all samples where the concentration of detergents is greater than 350 micrograms per litre corresponds to water polluted by bacteria and all samples where the concentration of detergents were less than or equal to 300 micrograms per litre and ammonia was less than 100 micrograms per litre is non-polluted water. These definitions would permit a decision in perhaps two-thirds of all areas studied and the area of uncertainty could perhaps be narrowed with further study and other environmental and meteorological parameters could be taken into account. (Smith - North Carolina)
W76-12590

SOME OBSERVATIONS REGARDING PENTACHLOROPHENOL LEVELS IN HAVERFORD TOWNSHIP, PENNSYLVANIA,
Villanova Univ., Pa. Dept. of Chemistry.
J. E. Fountaine, P. B. Joshipura, and P. N. Keliher.
Water Research, Vol. 10, No. 3, 1976. p 185-188, 3 fig, 2 tab, 9 ref.

Descriptors: *Water pollution sources, *Sampling, *Water pollution control, *Phenols, *Pesticide residues, Toxins, Chemical analysis, *Pennsylvania, *Path of pollutants, *Pollutant identification, Herbicides, Insecticides.
Identifiers: *Naylor's Run Creek(Penn), *Pentachlorophenol, Haverford Township(Penn).

Pentachlorophenol (PCP) is used extensively as a herbicide, fungicide and insecticide, and with a worldwide production annually of more than 20,000 tons, it represents a possible toxic pollutant, even when concentrations reach levels as low as .2 parts per million. Naylor's Run Creek (PA) was analysed for this compound because of suspected pollution. Samples from the creek were analysed using several spectographic and chromographic techniques. Concentrations of PCP ranged from .1 to 10 ppm. They were highest near the stream source and near a factory and lowest downstream. Since PCP does not decompose readily, it must be either absorbed or diluted while it goes downstream. For one sample a bottle containing water from the stream was left to stand for two days after which samples were withdrawn from various levels in the bottle. It was found that the concentration dropped as depth in the bottle increased, so that it is possible that the PCP is slowly diffusing from the oil slick which is present in the stream and the bottle. From this and other analysis the rate of PCP discharge was estimated at about 13.3 grams per hour into the stream. Though it might seem easy to combat this pollution by closing the factory, a definite source of PCP, seepage of PCP from the ground would most likely continue. It would be possible to skim oil from the stream to reduce pollution or use a coagulation system. Decomposing bacteria and macroreticular resin bed would also help. (Smith-North Carolina)
W76-12591

NITROGEN AVAILABILITY IN URBAN RUNOFF,
Wisconsin Univ., Madison. Water Chemistry Program.
W. F. Cowen, K. Sirisinha, and G. F. Lee.
Journal Water Pollution Control Federation, Vol. 48, No. 2, p 339-345, February, 1976. 4 fig, 16 ref.

Descriptors: *Pollutant identification, *Analytical techniques, *Nitrogen, *Urban runoff, *Chemical reactions, Organic compounds, Ammonia, Nitrites, Nitrates, Bacteria.
Identifiers: Mineralization, Ammonia nitrogen, Nitrite nitrogen.

A series of mineralization tests were performed to study the reactions in which organic nitrogen is converted to ammonia nitrogen, which is converted to nitrite nitrogen, which is converted to nitrate nitrogen in urban runoff under the influence of the bacteria in the runoff. Grab samples of urban runoff were collected from street gutters and open storm sewers in a low density residential area, a medium density area, and a university campus in Madison, Wisconsin. The samples were chemically analyzed for ammonia nitrogen, nitrate nitrogen, total Kjeldahl nitrogen (TKN), and soluble Kjeldahl nitrogen (SKN). Nitrite nitrogen concentrations were assumed to be negligible. Runoff samples were then incubated in darkness for 82 to 100 days at 21 C and analyzed for ammonia nitrogen and nitrate nitrogen at intervals. The concentration of algal-available nitrogen was computed and the TKN and SKN values determined. The mineralized waters contained from 57% to 82% of total nitrogen as algal-available nitrogen, with an average of 70%. Since algal-available nitrogen in the fresh runoff samples ranged from 4 to 66% of total nitrogen, the influence of bacterial mineralization on the release of inorganic nitrogen from the runoff to the waters receiving the runoff is readily apparent. Gross underestimates of available total nitrogen could result if only the inorganic nitrogen data from chemical analyses of fresh runoff are considered. The mineralization of organic nitrogen forms should be considered in any estimates of the true, biologically important nitrogen loadings from urban runoff. (Snyder-FIRL)
W76-12596

URBAN RUNOFF AND COMBINED SEWER OVERFLOW, (LITERATURE REVIEW),
Environmental Protection Agency, Edison, N.J. Wastewater Research Div.
For primary bibliographic entry see Field 5D.
W76-12627

MICROBIOLOGY OF WASTE TREATMENT, (LITERATURE REVIEW),
Pennsylvania State Univ., University Park.
For primary bibliographic entry see Field 5D.
W76-12628

PERSISTENCE OF VIRUS ON SEWAGE-IRRIGATED VEGETABLES,
Ohio Bureau of Foods, Cincinnati. Virology Branch.
E. P. Larkin, J. T. Tierney, and R. Sullivan.
Journal of the Environmental Engineering Division, Proceedings of ASCE, Vol. 102, No. EE1, p 29-35, February, 1976. 3 tab, 23 ref, append.

Descriptors: *Waste water treatment, *Pollutant identification, *Viruses, *Persistence, *Irrigation effects, Sewage treatment, Activated sludge, Sewerage, Irrigation practices, Irrigation water, Sewage effluents.
Identifiers: *Spray irrigation.

The persistence of a human enterovirus, poliovirus 1, on lettuce and radishes fertilized with contaminated sewage wastes was studied. The contaminated wastes were obtained by mixing a suspension of poliovirus 1 with raw waste ac-

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vated sludge or secondary sewage effluent which ntained no naturally occurring viruses. They ere applied with an apparatus simulating existing ray irrigation equipment. Filtrate from slurries crushed lettuce, radish leaves, and radishes was sayed for virus using a plaque-forming method. liovirus 1 persisted on lettuce and radishes for to 36 days. Since present treatment systems do t completely remove viruses from sewage dge or effluent, municipalities contemplating wage disposal on land should investigate the use crops other than those in the food chain until atment and monitoring methods are sufficiently proved to preclude the seeding of food crops h human pathogens. (Snyder-FIRL)
76-12634

XING AND TRANSPORT, (LITERATURE VIEW),
gonne National Lab., Ill. Energy and Environntal Systems Div.
). Ditmars.
rnal Water Pollution Control Federation, Vol. No. 6, p 1620-1639, June, 1976. 199 ref.

scriptors: *Mixing, *Dispersion, Hydrodynam- *Groundwater, *Surface waters, Lakes, eans, Estuaries, Rivers, Reservoirs, Bays, eams, Model studies, Industrial wastes, Waste er, Marshes, Drainage systems, Oil, Circula-, *Reviews, *Bibliographies, Path of pollu-ts.
ntifiers: *Literature reviews.

literature review of mixing and transport nomena associated with surface waters and ndwater is presented. Specific topics ussed include: longitudinal dispersion cesses in rivers; procedures for determining assimilation capacity of streams; the rodynamics of large lakes; a model for the nal temperature distribution in a deep reser-; a classification scheme for numerical models vater and waste movement in tidal bays and ries; measurements of a salt marsh drainage em; water quality forecasts for a number of ll bays on the Florida coast; the development inite-element models for one- and two-layer tal circulation; the fluid mechanics of waste r disposal in the ocean; studies on the harge of heated waters into rivers, lakes, aries, and oceans; the design and operation of circulating flume for the development of ria for power plant intake screens; the effect gh initial dilution on the dispersion of fluid- mixtures dumped into the oceans; and dentu- on the spreading of oil on water surfaces r different conditions. (Kreager-FIRL)
-12672

Effects Of Pollution

EFFECTS OF CADMIUM ON FRESH- ER PHYTOPLANKTON,
ont Univ., Burlington. Dept. of Biochemis-

Hart, and P. W. Cook.
able from the National Technical Informa- Service, Springfield, VA 22161 as PB-257 547, in paper copy, $3.00 in microfiche. Vermont r Resources Research Center, Burlington, letion Report, July 1975, 106 p. OWRT A-t(1).

iptors: *Cadmium, Heavy metals, Lakes, oplankton, Plankton, Plant growth, Acidity, chains, Inhibition, Photosynthesis, Carbon le, Oxygen, Water pollution effects.

ts were determined of cadmium on selected s of freshwater algae, including strains iso- from the plankton. Total growth of mixed plankton cultures exposed for 8 days to 0.50 Cd was 25% of control cultures. Certain ns, flagellates, and blue-green algae appeared to be most sensitive to Cd whereas 2 genera of diatoms (Nitzschia and Flagilaria) and green algae such as Chlorella were relatively resistant. The results indicate that: (1) natural phytoplankton are sensitive to Cd present in the water in which they are growing; (2) Cd has a selective effect upon different species within a heterogeneous population; (3) a similar selective effect can also be demonstrated with uni-algal cultures exposed to Cd; (4) resistant algal strains can concentrate as much as 500-fold greater concentrations than present originally in the growth medium and thus could pose a potential hazard to the food-chain; (5) the extent to which Cd is accumulated is a function of the acidity and the electrolyte composition of the aquatic environment; (6) cultures grown in non-lethal concentrations of Cd have reduced ability to carry out the photosynthetic activities of oxygen evolution and carbon dioxide fixation; (7) the degree of inhibition of CO2 fixation and O2 evolution is directly related to the sensitivity of the organism to cadmium.
W76-12152

HYDROLOGIC IMPACT OF BURNING AND GRAZING ON A CHAINED PINYON-JUNIPER SITE IN SOUTHEASTERN UTAH,
Utah State Univ., Logan. Dept. of Range Science.
For primary bibliographic entry see Field 4C.
W76-12153

FURTHER THERMAL ADDITION STUDIES AT CRYSTAL RIVER, FLORIDA WITH AN ANNOTATED CHECKLIST OF MARINE FISHES COLLECTED 1969-1971,
Florida Dept. of Natural Resources, St. Petersburg. Marine Research Lab.
J. A. Mountain.
Fla Dep Nat Resour Mar Res Lab Prof Pap Ser. 20, p 1-103. 1972.

Descriptors: *Florida, Marine fish, Data collections, Stations, Ecological distribution, *Environmental effects, Spawning, Hydrography, Surveys, *Estuarine environment, Steam, Electric powerplants, Thermal water, Nuclear powerplants, Discharge(Water), Channel flow, *Water temperature, Salinity, Trace elements, Oysters, *Water pollution effects, *Thermal pollution, Fish physiology, Copper, Statistical methods, Algae.
Identifiers: *Crystal River(Fla), Coal pile runoff water, Diversity indexes.

Hydrographic and biological data collected during the first 6 mo. of 1971 are presented. These, plus 1969 and 1970 data, complete an ecological survey of estuarine and coastal areas near Florida Power Corporation's Crystal River, Florida, steam electric generating station. This base line information should be compared with data collected after a nuclear generator becomes operational (mid-1974 or later). Discharge canal temperature was directly related to electricalpower output, with 2 daily peaks and a notable decrease from the late night to early morning. A wide range of salnities occurred in the study area. Trace metal levels from oysters near the power plant are also presented. Highest Cu levels were recorded in April 1971 (63.0 ppm) and Oct. 1969 (80.0 ppm). Correlatives may include spawning activity, increased metabolic rates, and Cu ions in coal pile runoff water. Distribution of benthic algae and invertebrates was similar to that previously reported. An annotated checklist of fishes collected during the 2 1/2 yr study is appended. Based on some 33,000 specimens (53 families), the list includes 95 identified species plus 9 either grouped together or identified to genus only. Diversity indices (S-1/LeN) were calculated from 1971 fish data and comparable periods in 1969 and 1970. The patterns of values for stations nearer river influence differed from the pattern at more remote stations.--Copyright 1973, Biological Abstracts, Inc.
W76-12163

HYDROGRAPHY AND PHYTOPLANKTON OF THE COAST OF CASTELLON, FROM SEPTEMBER 1969 TO JANUARY 1971, (IN SPANISH),
Instituto de Investigaciones Pesqueras, Barcelona (Spain).
For primary bibliographic entry see Field 5A.
W76-12164

POTENTIAL EFFECTS OF FOREST MANAGEMENT PRACTICES ON STORMFLOW SOURCES AND WATER QUALITY,
Forest Service (USDA), Oxford, Miss. Southern Forest Experiment Station.
R. S. Beasley.
In: Proceedings, Mississippi Water Resources Conference 1976, p. 111-117. 1976. 34 refs. Water Resources Research Institute, Mississippi State University.

Descriptors: *Subsurface flow, *Sewage disposal, *Sediment yield, Water quality, *Soil water movement, Overland flow, Erosion, Forest management, *Mississippi, Coastal Plains, Limbering, Sites, Land use, Planning, Forest management, Storm runoff.

Disturbances from clearcut logging, intensive site preparation, and sewage disposal on forest lands may alter the normal flow processes and impair water quality. Especially vulnerable are stormflow source areas and sites subject to rapid subsurface flows. Skid trails are the primary source of sediment from logging; but increased water yields after cover removal expand source areas, increase overland flows, and initiate sheet and rill erosion. Litter decomposition after clearcutting exposes mineral soil and promotes surface sealing which reduces infiltration and increases overland flow and sediment yield. Increased flow through macrochannels may accelerate erosion within the openings and increase sediment delivery to streams even in the absence of surface erosion. Intensive site preparation often removes all vegetation and most of the forest floor, compacts the soil surface, and seals macrochannel openings, thereby altering the normal flow processes. Sewage effluent disposed on source areas and sites with rapid subsurface flows may pass unaltered through macrochannels or overland to stream channels, posing serious pollution problems. The key to minimizing hydrologic impacts of forest management is to categorize each site according to its suitability for specific treatments, recognizing the variable rather than fixed nature of stormflow source areas. (Forest Service)
W76-12173

MERCURY IN WADERS FROM THE WASH,
Nature Conservancy, Abbots Ripton (England). Monks Wood Experimental Station.
For primary bibliographic entry see Field 5A.
W76-12176

SUB-LETHAL EFFECTS OF CHLORINATED HYDROCARBONS ON BIVALVES,
Queen's Univ., Belfast (Northern Ireland). Dept. of Zoology.
P. Roberts.
Marine Pollution Bulletin, Vol. 6(2), 1975, pp. 20-24, 1 tab., 5 fig., 14 ref.

Descriptors: *Animal behavior, *Benthic organisms, *Clams, *Toxicity, Animal physiology, *Respiration, *Chlorinated hydrocarbon pesticides, Physiology, Behavior, Mollusks, *DDT, *Polychlorinated biphenyls, *Dieldrin, *Endrin, Environmental effects, Mussels.
Identifiers: *Endosulfan, Oxygen consumption(Bivalves), Heart beat, Mya arenaria, Pecten maximus, Mytilus edulis, HEOD, Sub-lethal effects.

Chlorinated hydrocarbon pesticides are present in low concentration in most waters. While generally

not causing direct mortality so far as is known, they may well have sub-lethal effects, reducing the health and viability of marine organisms. In this study the effect of Endosulfan, endrin, DDT and dieldrin on respiration, heart beat and burrowing of some marine bivalves has been examined. The tests included in this study broaden the scope of toxicity testing using bivalves and illustrate a range of potential tests by which pollutant toxicity might be gauged. (Katz)
W76-12177

THE TROPHIC STATE OF NORTH CAROLINA LAKES,
North Carolina Univ. at Chapel Hill. Dept. of Environmental Sciences and Engineering.
C. M. Weiss, and E. J. Kuenzler.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-257 491, $10.50 in paper copy, $3.00 in microfiche. North Carolina Water Resources Research Institute, Raleigh, UNC-WRRI Rpt. No. 119, July 1976. 224 p, 1 fig., 63 tab, 62 ref, 2 append. OWRT A-078-NC(2), 14-31-0001-5033.

Descriptors: *Trophic level, *Eutrophication, *Mesotrophy, *Oligotrophy, *Lakes, Reservoirs, Water quality, Conductivity, Nutrients, Phosphorous, *North Carolina, Impoundments, Water pollution effects, Phytoplankton, Secchi disk, Monitoring.
Identifiers: *Pollution index, *Trophic scale.

Water quality data assembled over the period 1971-1975 from the lakes and impoundments of North Carolina constituted a data pool of 854 observations that were used to describe their trophic state. Each of the 854 observation was considered a microcosm and was described in terms of its physical and chemical environment and the contained microflora (phytoplankton). By means of computerized sorting procedures and examination of known and implied relationships of more than 20 variables for each observation it was determined that total phosphorus, conductivity, and the pollution index had the most consistent and strongest correlations with measure of trophic state. Utilizing these, plus Secchi disk depth, a six-step trophic scale was defined for North Carolina waters ranging from oligotrophic to hypereutrophic. A total of 69 lakes, reservoirs, or subsegments of reservoirs were accordingly classified: 8 oligotrophic; 15 oligo-mesotrophic; 24 mesotrophic 17 alpha-eutrophic; 3 beta-eutrophic; and 2 hypereutrophic. Relating this six-step trophic scale to the mean depth of 41 of these bodies of water revealed a strong and significant negative correlation that identified a mean depth of 15-20 ft. as being a critical value for waters of high quality, low on the trophic scale. It is recommended that trophic state monitoring in North Carolina be based upon the variable total phosphorus, conductivity and Secchi disk transparency. (Stewart-North Carolina State)
W76-12210

A LIMNOLOGICAL STUDY OF SPIRITWOOD LAKE, N. D., WITH SPECIAL EMPHASIS ON ITS WATER QUALITY, SEASONAL CYCLES OF CHEMICAL NUTRIENTS, PHYTOPLANKTON, ZOOPLANKTON AND PRIMARY PRODUCTION, PART I: PHOTOSYNTHETIC PRODUCTION AND ENERGY CONVERSION IN SPIRITWOOD LAKE, NORTH DAKOTA,
North Dakota State Univ., Fargo. Dept. of Zoology.
G. W. Comita, and E. G. Wolf.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-257 734, $3.50 in paper copy, $3.00 in microfiche. North Dakota Water Resources Research Institute, Fargo, Research Report, No. WI-222-006-75, March 1975. 10 p, 6 fig, 4 tab. OWRT B-001-NDAK(3). 14-01-0001-882.

Descriptors: *Phytoplankton, Solar radiation, *Primary productivity, *North Dakota, *Photosynthesis, *Energy conversion, Lakes, Water pollution effects.
Identifiers: Spiritwood Lake(ND).

Gross integral production in Spiritwood Lake, North Dakota, measured by the light and dark bottle method from June 6 to September 7, 1966, was 111.1 cal per sq. cm for a solar radiation energy conversion efficiency of 0.36 per cwt. Estimates for the entire year yielded 159.2 cal per sq. cm and an efficiency of 0.19 per cwt. Integral phytoplankton respiration (June 6 through September 7) was 23.6 cal per sq. cm or 21.2 percent of integral gross production, from which a P-to-R ratio of 5.03 was calculated. Integral net phytoplankton production for the summer was 87.5 cal per sq. cm for an efficiency of 0.28 percent. This value for the entire year (8.3 months) was 121.3 cal per sq. cm or 0.20 percent of the available incident solar radiation. (See also W76-12214)
W76-12213

A LIMNOLOGICAL STUDY OF SPIRITWOOD LAKE, N. D., WITH SPECIAL EMPHASIS ON ITS WATER QUALITY, SEASONAL CYCLES OF CHEMICAL NUTRIENTS PHYTOPLANKTON, ZOOPLANKTON AND PRIMARY PRODUCTION, PART II: CAUSES AND CONTROL OF ALGAL BLOOMS IN SPIRITWOOD LAKE, NORTH DAKOTA,
North Dakota State Univ., Fargo. Dept. of Zoology.
J. J. Peterka, and J. W. Held.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-257 735, $3.50 in paper copy, $3.00 in microfiche. North Dakota Water Resources Research Institute, Fargo, Research Report, No. WI222-006-75, March 1975, 18 p, 3 fig, 3 tab, 17 ref. OWRT-B-001-NDAK(3). 14-01-0001-882.

Descriptors: *Eutrophication, Nutrients, *North Dakota, Lakes, *Nitrogen, *Phosphorus, Estimating, Water pollution sources, Water pollution effects, *Algal control, Algicides.
Identifiers: *Spiritwood Lake(ND), Cutrine, Hydrothol.

Sources and possible means of control of algal blooms in Spiritwood Lake, a popular recreational lake, were investigated during the summer of 1970. The objective was to provide a preliminary estimate of sources of nitrogen and phosphorus and to recommend necessary research approaches toward solving eutrophication problems of the lake. Of the estimated nitrogen and phosphorus entering the lake during spring runoff, 62 percent of the nitrogen and 95 percent of the phosphorus appeared to come from diffuse land surface sources, such as drainage from fields and grasslands. Nitrogen, and to a lesser degree phosphorus, in livestock excrement are potentially important contributors to nutrient enrichment. Field experiments indicated that additions of inorganic nitrogen increased algal production whereas phosphorus inhibited it. (See also W76-12213)
W76-12214

ENVIRONMENTAL ANALYSIS FOR BAHAMAS SUPERTANKER PORT,
Erindale College (Ontario).
For primary bibliographic entry see Field 5G.
W76-12222

ENVIRONMENTAL PROBLEMS ASSOCIATED WITH A PIPELINE LANDFALL IN COASTAL DUNES AT CRUDEN BAY, ABERDEENSHIRE, SCOTLAND,
Aberdeen Univ. (Scotland).
For primary bibliographic entry see Field 5G.
W76-12223

ENVIRONMENTAL CONSIDERATIONS OF OFFSHORE GENERATING STATIONS,
Public Service Electric and Gas Co., Newark, N.J.
For primary bibliographic entry see Field 5G.
W76-12225

CONTAMINANT EFFECTS ON BIOTA OF THE NEW YORK BIGHT,
State University of New York at Stony Brook. MESA New York Bight Project
J. S. O'Connor.
In: Gulf and Caribbean Fisheries Institute, Proceedings, Twenty-Eighth Annual held in Bal Harbour, Florida, October 1975, May 1976. p 50-63, 8 fig, 23 ref.

Descriptors: *Continental Shelf, *Environmental effects, Water resources, *Waste disposal, Fish, Shellfish, Bacteria, Coliforms, Heavy metals, Flotsam, Biota, Coasts, Ecology.
Identifiers: *Outer Continental Shelf, *New York Bight, Ocean dumping, Antibiotics, Environmental impact.

The Marine EcoSystems Analysis (MESA) Project of NOAA was initiated in 1973 to assess the impacts of man's activities and the natural influences on the New York Bight. Several examples of contaminant impacts on marine resources have been identified rather quickly: (1) high prevalence of diseases in several species of finfish and shellfish; (2) major alterations in the distribution and abundance of bottom living organisms; (3) widespread distribution in exceptionally high numbers of coliform and fecal coliform bacteria, indicative of pathogenic bacteria (which findings have led to closure of clam fishing operations in extensive areas around and landward of ocean dumping sites); (4) presence of transfer-resistant (R+) bacteria which are resistant to broad spectra of heavy metals and antibiotics; and (5) noxious concentrations of suspended particulate material, flotsam and surface slicks, particularly on beaches used very intensively for bathing and sportfishing. (See also W76-12226) (Sinha - OEIS)
W76-12229

A STUDY OF THE EFFECTS OF STREAM CHANNELIZATION AND BANK STABILIZATION ON WARMWATER SPORT FISH IN IOWA: SUBPROJECT 5: EFFECTS OF LONG-REACH STREAM CHANNELIZATION ON DISTRIBUTION AND ABUNDANCE OF FISHES,
Iowa Cooperative Fishery Unit, Ames.
For primary bibliographic entry see Field 4C.
W76-12230

A STUDY OF THE EFFECTS OF STREAM CHANNELIZATION AND BANK STABILIZATION ON WARMWATER SPORT FISH IN IOWA: SUBPROJECT 4: THE EFFECTS OF LONGREACH CHANNELIZATION ON HABITAT AND INVERTEBRATE IN SOME IOWA STREAMS,
Iowa Cooperative Fishery Unit, Ames.
For primary bibliographic entry see Field 4C.
W76-12231

A STUDY OF THE EFFECTS OF STREAM CHANNELIZATION AND BANK STABILIZATION ON WARMWATER SPORT FISH IN IOWA: SUBPROJECT NO. 3 SOME EFFECTS OF SHORT-REACH CHANNELIZATION ON FISH AND FISH FOOD ORGANISMS, IN CENTRAL IOWA WARM WATER STREAM,
Iowa Cooperative Fishery Unit, Ames.
For primary bibliographic entry see Field 4C.
W76-12232

A STUDY OF THE EFFECTS OF STREAM CHANNELIZATION AND BANK STABILIZATION ON WARMWATER SPORT FISH IN IOWA: SUBPROJECT 2. A STUDY OF THE IM-

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T OF SELECTED BANK STABILIZATION
UCTURES ON GAME FISH AND AS-
IATED ORGANISMS,
Cooperative Fishery Unit, Ames.
rimary bibliographic entry see Field 4C.
-12233

M WATER STREAM ALTERATION IN
A: EXTENT, EFFECTS ON HABITAT,
, AND FISH FOOD, AND EVALUATION
STREAM IMPROVEMENT STRUCTURES
IMARY REPORT),
Cooperative Fishery Unit, Ames.
rimary bibliographic entry see Field 4C.
12235

ICITY OF AMMONIA, NITRITE ION,
ATE ION, AND ORTHOPHOSPHATE TO
CENARIA MERCENARIA AND CRASSOS-
A VIRGINICA,
vare Univ., Lewes. Coll. of Marine Studies.
Epifanio, and R. F. Srna.
e Biology, Vol. 33, p. 241-246, 1975. 2 tab.,
.

iptors: *Feeding rates, Animal behavior,
nile growth stage, *Oyster, *Clams, *Lethal
*Shellfish, *Toxicity, Commercial shellfish,
ssay, *Nitrites, *Nitrates, *Ammonia, Ions,
phates, Aquiculture, Environmental effects,
pollution effects, Laboratory tests, Inver-
es, Marine animals, Mollusks.
fiers: Sublethal limits, *Orthophosphates.

6-h lethal tolerance limits of the hard clam
naria mercenaria and the oyster Crassostrea
ica to ammonia, nitrite and nitrate ions, and
hosphate were defined. The lethal limit
l from 110 to 880 mg/l for ammonia and
081 to 2415 mg/l for nitrite ion. Nitrate ion
dium phosphate showed little if any toxicity
highest test levels. Sublethal effects of the
cals upon the rates at which the shellfish
ed algal cells from suspension were studied.
thal toxic concentrations of ammonia, 7.2
might be achieved in stressed natural en-
ents. Hard clams and oysters are extremely
t to these substances in comparison to other
and aquatic species. (Katz)
2237

CTS OF TEMPERATURE AND SALINITY
ROWTH AND UPTAKE OF 65ZN AND
FOR SIX MARINE ALGAE,
Andrews Presbyterian Coll., Laurinburg, N.
of Mathematics and Natural Science.
tyron, T. M. Hagan, D. R. Campbell, J.
, and N. K. Whittenburg.
l of the Marine Biological Association of
ited Kingdon, Vol. 56, No. 1, p. 13-20, 1976,
tab., 20 ref.

otors: *Marine algae, *Growth rate,
ctivity, *Radioisotopes, Environmental ef-
*Absorption, *Chlamydomonas, *Zinc
otopes, *Salinity, *Temperature,
say, Zinc, Cesium, Algae, Laboratory tests,
Alkali metals, Fallout, Path of pollutants,
sion analysis, Thermal pollution, Water
n effects.
ers: *Bioaccumulation, Achnanthes sp.,
a sp., Dunaliella sp., Phaeodactylum sp.,
hloris sp., *Cesium radioisotopes.

ion growth and concentration factors for
nd 137Cs were measured for Achnanthes
s, Carteria sp., Chlamydomonas sp., Dul-
salina, Nannochloris atomus, and
actylum tricornutum subjected to factorial
ations of eight temperatures (6-40 C) and
nities (3.4-44.0 p.p.t.). Regression coeffi-
were calculated for polynomial models
ng response surfaces for growth and
clide concentration. Salinity was more im-
than temperature in describing population growth for Carteria, Dunaliella, Nannochloris and Phaeodactylum. Temperature accounted for more variation in 65Zn concentration factors than salinity or population growth in all algae Dunaliella. Concentration factors for 65Zn were uniformly higher than 137Cs concentration factors. (Katz)
W76-12238

LEAD NITRATE POISONING IN THE CARP (CYPRINUS CARPIO L.):LOCALIZATION OF THE POLLUTANT IN THE BODY, (IN FRENCH),
Toulouse-3 Univ. (France). Laboratoire d'Ecophysiologi des Animaux.
For primary bibliographic entry see Field 5A.
W76-12251

HYGIENIC AND TOXICOLOGICAL EVALUATION OF SOME GRADES OF RUBBER USED IN DOMESTIC WATER SUPPLY SYSTEMS, (IN RUSSIAN),
Municipal Sanitary-Epidemiological Center, Moscow (USSR).
G. L. Sardarova.
Gig Sanit. 4, p 103-104, 1974.

Descriptors: Toxicity, Public health, Rubber, Domestic water, Water supply, Corrosion control, Protective coating, Organoleptic properties, Rodents.
Identifiers: Aldolase, Blood, Liver.

Results of a hygienic and toxicological evaluation of rubbers Nos. 1976, 2566 and 1751 used for anticorrosive coatings are presented. The investigation showed the possibility of using rubbers Nos. 1751 and 1976 as anticorrosive coatings on water lines and that rubber No. 2566 cannot be used, since it has an unfavorable effect on the organoleptic properties of water. In a 5-mo. experiment in which rats received daily a 3-day infusion of water on the investigated rubber specimens as drinking water, no significant changes were noted in the condition of the animals, their weight, condition of the peripheral blood, blood coagulation, liver function, content of blood metHb and activity aldolase. --Copyright 1975, Biological Abstracts, Inc.
W76-12252

EFFECT OF LINDANE ON TROUT FRY (SALMO IRIDEUS GIBB.) CHANGES IN GLYCOLYTIC ENZYMES, (IN FRENCH),
Paris-7 Univ. (France). Lab. of Comparative Anatomy.
H. Boulekbache, and C. Spiess.
Bull Soc Zool Fr. 99(1), p 79-85, 1974.

Descriptors: *Trout, *Insecticides, *Fry, *Growth stages, *Metabolism, Carbohydrates, Water pollution effects, Enzymes.
Identifiers: Aldolase, Dehydrogenase, Kinase, Lactate, *Lindane, Liver, Muscle.

S. irideus fry is highly sensitive to lindane (an insecticide) treatment, the sensitivity increasing with the stage of development from hatching to yolk-sac resorption. The effect is revealed by marked changes in the histological structure of the liver and muscle as in the levels of the glycolytic enzymes: lactic-dehydrogenase (LDH), pyruvate kinase, aldolase as well as phosphoglucomutase. The decrease in LDH activity is especially noted. A modification in carbohydrate metabolism of trout fry when exposed to lindane is possible. --Copyright 1975, Biological Abstracts, Inc.
W76-12253

DEGRADATION OF DDT IN AN EVERGLADES MUCK AS AFFECTED BY LIME, FERROUS IRON AND ANAEROBIOSIS,
Agricultural Research Service, Baton Rouge, La.
For primary bibliographic entry see Field 5B.
W76-12254

PRINCIPLE OF A TECHNICAL DEVICE FOR THE STUDY OF TOXIC EFFLUENTS IN WATER POLLUTION, (IN FRENCH),
Toulouse-3 Univ. (France). Laboratoire d'Ecophysiologi des Animaux.
For primary bibliographic entry see Field 5A.
W76-12255

STUDIES ON OIL POLLUTION AND SEABIRDS IN DENMARK 1968-1971,
Game Biology Station, Ronde (Denmark).
A. H. Joensen.
Dan Rev Game Biol. 6(9), p 1-32, 1972.

Descriptors: *Oil pollution, *Oil spills, Water pollution effects, *Birds, Waterfowl, *Ducks(Wild), Mortality.
Identifiers: *Denmark, *Seabirds, Seaducks.

The purpose of the studies on oil pollution was 2-fold: firstly, to examine the extent of oil pollution and obtain as good an estimate as possible of the number of birds killed, and secondly, by examination of the dead birds, to obtain information on the age and sex-composition of the seaduck populations. The results of studies made during July 1968-June 1971 are given. In addition to general recording of cases of oil pollution, detailed studies were made of 5 large disasters. The maintenance of a rich fauna of seabirds, and especially seaducks, not only in Denmark but the whole of Western Europe, requires measures in Danish waters against the minor cases of pollution now occurring, such that their future extent is decreased.--Copyright 1975, Biological Abstracts, Inc.
W76-12256

ISOLATION OF PARASITIC AND SAPROPHYTIC STRAINS OF BDELLOVIBRIO BACTERIOVORUS FROM NATURAL WATERS, (IN RUSSIAN),
Moskovskii Gosudarstvennyi Meditsinskii Institut (I) (USSR). Dept. of Public Hygiene; and Moskovskii Gosudarstvennyi Meditsinskii Institut (I) (USSR). Dept. of General Hygiene.
For primary bibliographic entry see Field 5A.
W76-12262

A RED BLOOM IN HORN SO NEAR LEMVIG (N. W. JUTLAND), CAUSED BY THE DINOFLAGELLATE OXYRHIS MARINA, (IN DANISH),
Copenhagen Univ. (Denmark). Inst. of Plant Anatomy and Cytology.
J. Kristiansen.
Flora Fauna. 80(3), p 65-69, 1974.

Descriptors: *Dinoflagellates, Lakes, Europe, *Eels, *Ecological distribution, Fishkills, Oxygen, Water pollution effects, Toxicity, Toxins.
Identifiers: Jutland, Lemvig, *Oxyrrhis-marina, *Red bloom(Lakes), *Horn So(Denmark).

On Sept. 24, 1973, it was observed that the water of Horn So, a small lake near Lenvig (N. W. Jutland), was colored intensely red. At the same time 200 kg of eels kept in tanks in the lake were killed. The lake is connected with the Limfjord and has a salinity of about 24 0/00. The red color was due to a mass development (about 300,000 cells/ml) of the apochlorotic dinoflagellate O. marina Duj. This organism is described, and details of its distribution and ecology are discussed. The fish kill is supposed to have been caused by Oxyrrhis, but it could not be decided whether toxic substances produced by this organism or oxygen deficiency were responsible. References are made to similar blooms of other dinoflagellates, but blooms of Oxyrrhis, causing fish kills, have apparently not been recorded previously.--Copyright 1975, Biological Abstracts, Inc.
W76-12264

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SPECIFIC FEATURES OF PHYTOPLANKTON IN THE LOWER COURSE OF THE IRTYSH RIVER, (IN RUSSIAN),
Tyumenskii Gosudarstvennyi Meditsinskii Institut (USSR).
E. I. Yurova.
Izv Sib Otd Akad Nauk SSSR Ser Biol Nauk. 1, p 133-135, 1974.

Descriptors: *Phytoplankton, *Systematics, *Algae, *Cyanophyta, Effluents, Rivers, *Eutrophication, Water pollution effects.
Identifiers: Asterionella-formosa, Cyanarcus-hamiformis, Fragilaria-crotonensis, Melosira-distans-var-alpigena, Melosira-granulata-var-granulata, Melosira-islandica-F-islandica, Microcystis, Scenedesmus, Tetracus-ilsteri, *USSR(Irtysh River).

During years of research 297 water-plant taxa were registered in the lower course. Only 112 forms are common of the middle and lower course. Double species structure enrichment of the leading groups of algae is registered near the river-mouth. Prevalent forms of the low Irtish (USSR) biocenoses are Melosira granulata (Ehr.) Ralfs var. granulata, Fragilaria crotonensis Kitt. Asterionella formosa Hass. A variety of Scenedesmus and Microcystis species is presented. A series of genera new to Irtish is given in this article including Melosira islandica O. Mull. f. islandica, M. distans (Ehr.) Kutz. var. alpigena etc. Uncommon water-plants have been registered such as Tetracus ilsteri Skuja, Cyanarcus hamiform is Pasch. The conclusion concerns the influence of flood-lands reservoir effluents promoting the enrichment of the phytoplankton of Low Irtish. Sometimes blue-green algae play an important part.--Copyright 1975, Biological Abstracts, Inc.
W76-12267

SUCCESSION OF PLANKTON DIATOMS IN TOKYO BAY, (IN JAPANESE),
Tokyo Univ. (Japan). Ocean Research Inst.
R. Marumo, and M. Murano.
Mer (Tokyo). 11(2), p 70-82, 1973.

Descriptors: *Succession, *Planktons, *Diatoms, Bays, Cyanophyta, Algae, Copepods, Crustaceans, Asia, Standing crops, *Eutrophication, Red tide, Distribution, Water pollution effects, *Dinoflagellates, Primary productivity.
Identifiers: Chaetoceros-affinis, Chaetoceros-debilis, Chaetoceros-decipiens, Chaetoceros-socialis, Chaetognaths, Coscinodiscus, Ditylum-brightwellii, Diversity, Eucampia-zoodiacus, Eutrophication, Nitzschia-seriata, Rhizosolenia-setigera, Skeletonema-costatum, Thalassionema-nitzschioides, Thalassiosira, *Tokyo Bay(Japan).

The succession of plankton diatoms in Tokyo Bay (Japan) was studied, on the basis of the investigations carried out in 1947, 1966-68 and 1972-73. The species number was smaller in the bay than in Uraga Channel as to diatoms as well as blue-green algae, dinoflagellates, copepods, cladocera and chaetognaths. Recently, any oceanic species of these taxonomic groups have not been found in the inner part of the bay. The number of diatom species in the inner part of the bay was 35 in 1947, 28 in 1966-68 and 23 in 1972-73. Oceanic diatoms amounted to 12 spp. in 1947, but they disappeared in the latter 2 periods. Dominant diatoms in the bay were Chaetoceros affinis, C. decipiens, Rhizosolenia setigera, Skeletonema costatum, Nitzschia seriata and Thalassionema nitzschioides in 1947 and Chaetoceros debilis, C. socialis Coscinodiscus spp. Thalassiosira spp., Eucampia zoodiacus, Ditylum brightwellii, Rhizosolenia setigera Skeletonema costatum and Nitzschia seriata in 1966-68 and 1972-73. The diatom community in 1927 was somewhat different from that in 1947, but oceanic diatoms were distributed in both these years. The frequent occurrence of diatom red tides since the 1950's suggests that the diatom standing crop had remarkably increased in the bay in recent years. S. costatum had been the most important species as a red tide organism as well as in the standing crop in usual distribution in the bay from 1947 on, Judging from the succession of the standing crop and species number of diatoms, water of Tokyo Bay was eutrophic in 1947 and extremely eutrophic in recent years. It may possibly become even polysaprobic, if the eutrophication and the pollution will be accelerated from now on.--Copyright 1975, Biological Abstracts, Inc.
W76-12268

QUANTITY OF HETEROTROPHIC BACTERIA ON SOME HIGHER PLANTS IN CARP PONDS, (IN RUSSIAN),
Ukrainian Research Inst. of the Fish Industry, Kiev (USSR).
For primary bibliographic entry see Field 5B.
W76-12271

THE INFLUENCE OF GRASS-CARP POPULATION (CTENOPHARYNGODON IDELLA VAL.) ON THE VEGETATION AND ECOSYSTEM OF LAKE TRAKOSCAN, (IN SERBO-CROATIAN),
Zagreb Univ. (Yugoslavia). Institut za Biologijo.
M. Mestrov, L. Ilijanic, V. Tavcar, and J. Koprek.
Acta Bot Croat. 32, p 125-134, 1973.

Descriptors: *Dissolved oxygen, *Mud, Lakes, Europe, Organic matter, Sedimentation, Organic matter, *Carp, Respiration, Ecosystems, Microorganisms, Phytoplankton, Zooplankton.
Identifiers: Ctenopharyngodon-Idella, Grass Carp, *Lake Trakoscan(Yugoslavia).

The lake is choked by mud so that the mud content rises to 37% of total volume. The main cause of muddiness is an alluviation of deposited mineral material. Abundant macrovegetation supports the sedimentation of inorganic and organic matter and causes a rise of the bottom. A large quantity of anaerobic microorganisms in the mud made anaerobic respiration possible over a great part of the lake. Decline in the quantity of dissolved O2 was noted every summer. Characteristic of the lake is its betamezosaprobity especially toward the bottom (alphamezosaprobity). The radical decrease in macrovegetation in 1971 caused by the grass-carp, resulted in essential alteration of physicochemical features of the water as well as in quantitative and qualitative changes in the plankton community. The disappearance of the dominant kinds of macrovegetation caused the elimination of the main consumer of CO2, followed by vigorous augmentation of dissolved carbon dioxide. In 1971 particularly in Aug., a decline was noticed in the quantity of dissolved O2. Strong fluctuations in the quantitative composition of zoo- and phytoplankton in 1971 indicate a disordered balance in the ecosystem caused by the planted fish. Recovery will require the cleaning of the lake by removing the mud and the construction of a sedimentary storage pond. The planting of grass-carp or other kinds of fish should be done cautiously and its effect will have to be controlled.--Copyright 1975, Biological Abstracts, Inc.
W76-12272

CONTRIBUTION TO EPIZOOTOLOGY OF SCHISTOCEPHALUS PUNGITII (LIGULIDAE) IN THE MANYCH-GUDILO LAKE, (IN RUSSIAN),
Rostov-on-Don State Univ. (USSR).
A. I. Kafanov, and I. M. Yazykova.
Zool Zh. 50(10), p 1572-1574, 1971.

Descriptors: *Epizootology, Lakes, Public health, Hosts, Intermediate hosts, Animal parasites, Diseases, Pathology.
Identifiers: Gelochelidon-Nilotica, Larus-Argentatus-Cacchinnans, Ligulidae, *Schistocephalus-Pungitii, Sterna-Hirundo, *Lake Manych-Gudilo(USSR).

An epizootic focus of schistocephalosis induced by S. pungitii exists in the Manych-Gudilo Lake, USSR. D. salinus and P. platygaster are intermediate hosts and Sterna hirundo, Gelochelidon nilotica and Larus argentatus cacchinans are final hosts. Epizootic foci of schistocephalosis may be spreading widely in southern USSR.--Copyright 1975, Biological Abstracts, Inc.
W76-12273

DISCOVERY OF LIGULA INTESTINALIS (GOEZE 1782) GMELIN, 1790 IN LERMICHTHYS MULTIRADIATUS (MEEK) (PISCES: GOODEIDAE), (IN SPANISH),
Universidad Nacional Autonoma de Mexico, Mexico City. Instituto de Biologia.
R. Lamothe-Argumedo, and A. Cruzreyes
Rev Soc Mex Hist Nat. 33, p 99-106, 1972.

Descriptors: *Mexico, Freshwater fish, Marshes, *Fish diseases, *Pathology, Mortality, Larvae, Epizoology.
Identifiers: Goodeidae, *Lermichthys-Multiradiatus, *Ligula-Intestinalis, Pisces, Cestodes.

The larva of Ligula intestinalis reported from Mexico for the 2nd time was found in the celom of Lermichthys multiradiatus, a freshwater fish captured in the Lerma marshes, Mexico. Larval Ligulidae are pathogenic to fish, especially to those of this small species; for besides the expoliative action characteristic of the cestodes, they displace the fish's viscera, producing serious complications which result in death, and thus may cause epizootics of considerable economic importance.--Copyright 1975, Biological Abstracts, Inc.
W76-12274

ON ENVIRONMENTAL FACTORS OF EEL POOLS: I. CHEMISTRY OF THE WATER AND SOIL AND PLANKTON IN OCTOBER 1965 AND JULY 1966, (IN JAPANESE),
Freshwater Fisheries Research Lab., Tokyo (Japan).
J. Toi, T. Ito, and Y. Satomi.
Bull Freshwater Fish Res Lab Tokyo. 21(1), p 1-13, 1971.

Descriptors: *Eels, Water chemistry, Plankton, *Soil chemistry, Anabaena, *Nitrogen compounds, Oxygen, Scenedesmus, *Environmental effects, Ponds, *Phosphorus, Compounds, *Phytoplankton, Zooplankton.
Identifiers: Microcystis.

Chemical and biological studies of water and soil in eel pools showed that dry fodder did not severely influence ecological conditions at least immediately after feeding. Under feeding conditions pH values and O2 values decreased in the early morning. O2 content varied from 0 to several hundred percent oversaturation. Concentrations of organically dissolved N compounds varies widely throughout the day. Organically dissolved P compounds show no essential changes. In the early morning Eh7 values of the water are dependent on O2 saturation. In pools where phytoplankton died due to a lack of nutrient salts the predominant phytoplankton species are not stable. Both organic N and P compound content correlates well with heat loss. When acid pool soils are neutralized by addition of lime, the predominant zooplankton species change. The ratio of particulate N/P is greater in the Microcystis eel pools than in the Scendesmus pools. The content of N compounds is lower in the Anabaena pools than in the Microcystis pools.--Copyright 1975, Biological Abstracts, Inc.
W76-12275

THE EXTENT OF HAZARD AND THE HYGIENIC STANDARDIZATION OF ISOPHTHALONITRILE IN BODIES OF WATER, (IN RUSSIAN),
Sanitarno-Gigienicheskii Meditsinskii Institut, Leningrad (USSR).

. Gaidamaka.
Sanit. 11, p 17-20, 1974.

criptors: *Public health, *Organoleptic proper- Rodents, Lethal limit, Toxicity, *Water quali- tandards, Water pollution effects, Digestion, rogen compounds.
tifiers: Guinea-Pig, Rabbit, *Isophthalonitrile.

d on the effects of isophthalonitrile on the or- leptic properties of water, the sanitary nen of water bodies and on mice, rats, guinea and rabbits, its maximal permissible concen- on in water bodies should be 5 mg/1.--Copy- 1975, Biological Abstracts, Inc.
-12286

TICAL DISTRIBUTION, SESTONIC SONAL DYNAMICE AND THE ROLE OF RITUS IN THE LAKE DAL'NEYE SYSTEM, (IN RUSSIAN),
lemiya Nauk SSSR, Moscow. Institut Biologii rennykh Vod.
Pavel'Eva.
biol Zh. 10(3), p 20-24, 1974.

riptors: *Vertical distribution, *Seston, s, Seasonal, Thermal stratification, Water erature, *Detritus, Vegetation, Daphnia, ystems.
ifiers: Cyclops-Scutifer, Daphnia-Lon- is, Filinia, Neutrodiaptomus-Angustilobus, anodiscus-Astraea, Organic carbon, Lake eye(USSR).

cal distribution of the seston components ding Stephanodiscus astrea, Cyclops scu- Daphnia longiremis, Neutrodiaptomus an- obus and Filinia) in Lake Dal'neye (USSR) e vegetation period is closely connected with mperature stratification of the water body. us comprises from 40-60% (at rest), to 90% e organic suspension. The proportional n average values of DOS, detritus and living isms correlate as 100:7:9. For the observa- eriod the value of total organic C in the sur- ayer was equal to an average of 4.16 mg/1 (to g/1).--Copyright 1975, Biological Abstracts,

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ON OF THE KIEV WATER RESERVOIR QUANTITATIVE RATIOS OF ITS COM- NTS, (IN RUSSIAN),
miya Nauk URSR, Kiev. Instytut iologii.
Primachenko, L. E. Mikhailenko, S. L. skaya, G. A. Enaki, and L. I. Pshenichnaya.
iol Zh. 10(3), p 12-19, 1974.

ptors: *Seston, *Biomass, *Reservoirs, storage, *Diatoms, *Phytoplankton, tion, Organic matter, Detritus, Bacteria, Plankton, Aquatic animals.
iers: Ukrainian-SSR, *Kiev water storage oir(USSR).

biomass of the Kiev water storage basin nian SSR, USSR) varied from 20-56 g/m2, rage value being 37 g/m2 (in dry weight). eae dominated the phytoplankton for the ion period. Organic material prevailed over material in the seston composition, ac- g, on an average, for about 80% of the total weight; 73% of the organic part was sed of detritus (mainly of autochonous and nic origin); 27%, of plankton (18%, algae; cteria; 3%, animals). The ratio of the plank- nponents (except Protozoa) expressed in ic units was algae, 71%; bacteria, 19% and , 10%.--Copyright 1975, Biological Ab- Inc.
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WINTER HYDROCHEMICAL CONDITIONS OF SMALL RIVERS IN THE POLESYE OF THE UKRAINIAN SSR (THE PRIPYAT BASIN), (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.
A. D. Konenko, I. G. Garasevich, and I. V. Grib.
Gidrobiol Zh. 10(3), p 5-11, 1974.

Descriptors: *Organic compounds, Rivers, Ions, Salts, *Gases, Odor, Industrial wastes, *Food processing industry, River basins, *Water chemistry, Winter.
Identifiers: *Sugar industry, Ukrainian-SSR(Pripyat basin), Polesye rivers(USSR).

The formation of ionic-salt compositions, the composition of biogenic and organic substances and of gaseous conditions of small Polesie rivers (USSR) in winter are considered in connection with natural and anthropogenic factors. Waste water of the food industry and sugar refineries have a considerable effect on the gaseous conditions and regime of organic substances in the rivers under study.--Copyright 1975, Biological Abstracts, Inc.
W76-12303

THE EFFECT OF DOMESTIC WASTE WATER ON THE DISTRIBUTION OF GAMMARUS PULEX L. AND GAMMARUS FOSSARUM KOCH IN A SUB-ALPINE MOUNTAIN STREAM IN HESSEN, (IN GERMAN),
Max-Planck-Institut Fuer Limnologie, Schlitz (West Germany). Limnologische Flussstation.
M. P. D. Meijering, A. G. L. Hagemann, and H. E. F. Schroeer.
Limnologica. 9(2), p 247-260, 1974.

Descriptors: *Domestic wastes, *Distribution, *Streams, Europe, Mortality, *Water temperature, Water purification, Seasonal, *Turbulence.
Identifiers: *Gammarus-fossarum, *Gammarus-pulex, *West German(E. Hessen).

The unpolluted streams of E Hessen (West Germany) are populated by G. fossarum along most of their length but G. pulex is concentrated mainly at the sources and lower courses due to temperature and turbulence. The slough system contained a small amount of G. pulex in a G. fossarum population which reached a maximum in autumn and almost disappeared in winter but never entirely. After purification of the water, only G. pulex reappeared in the lower course. When transferred to highly polluted water, G. pulex had the same pollution resistance in every season but its mortality rate was highest in heavily polluted water during summer. The same was true of G. fossarum but its populations diminished even faster.--Copyright 1975, Biological Abstracts, Inc.
W76-12304

DISTRIBUTION OF HETEROTROPHIC BACTERIA IN WATER AND BOTTOM DEPOSITS OF THE KREMENCHUG RESERVOIR IN RELATION TO THE INTENSITY OF DEVELOPMENT OF BLUE-GREEN ALGAE, (IN RUSSIAN),
Kiev State Univ. (USSR).
L. G. Brantsevich, and N. I. Sakharova.
Gidrobiol Zh. 10(6), p 62-65, 1974.

Descriptors: *Distribution, *Bacteria, Bottom sediments, *Reservoirs, *Cyanophyta, Algae, Path of pollutants.
Identifiers: *Heterotrophic bacteria, *Kremenchug Reservoir(USSR), Dnieper River(Ukranian SSR).

A study of the vertical, horizontal and seasonal distribution of microorganisms in the water column and bottom deposits of the Kremchug Reservoir on the Dnieper River (Ukrainian SSR, USSR) showed that the quantitative vertical distribution of bacteria and blue-green algae in the reservoir coincides. In the seasonal dynamics of heterotrophic bacteria, a summer-fall maximum is noted and for algae, a fall maximum. The number of algae and their physiological state affect the distribution of bacteria in the water and bottom deposits of the reservoir.--Copyright 1975, Biological Abstracts, Inc.
W76-12306

STUDIES OF MINERAL PHOSPHATE CONSUMPTION BY A TROPICAL WATER PLANKTONIC COMMUNITY, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Institut Biologii Vnutrennykh Vod.
Yu. I. Sorokin, and D. E. Vyshkvartsev.
Okeanologiya. 14(4), p 688-692, 1974.

Descriptors: *Phosphates, Phytoplankton, Plankton, *Pacific Ocean, Tropics, *Absorption, Bacteria.
Identifiers: *Mineral phosphate.

The intensity of phosphate consumption by a planktonic (including phytoplankton) community of the tropical waters of the SW Pacific was analyzed with the aid of P32. The rates of phosphate consumption (per day) were: 0.4 micrograms P/1 in the region of weak divergence, 0.1-0.3 micrograms P/1 in the region of convergence and 1-2 micrograms P/1 in the shallow waters. The turnover time of phosphate P in the surface waters was significant (100-200 h). In accordance with the size distribution of microplankton, a large part of phosphate is consumed by bacteria.--Copyright 1975, Biological Abstracts, Inc.
W76-12308

HYDROGRAPHY AND PHYTOPLANKTON FROM THE BAY OF CADIZ, FROM JANUARY OF 1970 TO DECEMBER OF 1973, (IN SPANISH),
Instituto de Investigaciones Pesqueras, Cadiz (Spain). Laboratorio de Investigaciones Pesqueras.
For primary bibliographic entry see Field 5A.
W76-12309

FIRST DATA ON THE EXPERIMENTAL STUDY OF THE ZINC CYCLE IN THE LAGOON OF L'OLIVIER, (IN FRENCH),
Centre National de La Recherche Scientifique, Marseille (France). General Biology and Ecology Lab.
For primary bibliographic entry see Field 5A.
W76-12310

HYGIENIC EVALUATION OF CERTAIN SURFACE-ACTIVE SUBSTANCES, COMPONENTS OF EFFLUENTS FROM TEXTILE INDUSTRY ENTERPRISES, (IN RUSSIAN),
Nauchno-Issledovatelskii Institut Epidemiologii i Mikrobiologii, Lvov (USSR).
For primary bibliographic entry see Field 5A.
W76-12314

HYGIENIC SUBSTANTIATION OF THE MAXIMUM PERMISSIBLE CONCENTRATION OF HYDROGEN PEROXIDE IN SURFACE WATERS, (IN RUSSIAN),
Ministerstvo Zdravookhraneniya SSSR, Moscow. Institut Biofiziki.
For primary bibliographic entry see Field 5A.
W76-12315

BACTERIOPLANKTON REPRODUCTION IN PHIALS WITH FILTERED WATER, (IN RUSSIAN),
Akademiya Nauk SSSR, Chita. Transbaik. Complex Expediton.
B. A. Shishkin, and A. A. Kalinina.
Gidrobiol Zh. 10(6), p 18-24, 1974.

LIBRARY U. OF I. URBANA-CHAMPAIGN

Descriptors: *Bacteria, Lakes, Trophic level, *Filtration, *Absorption, Plankton, Reproduction, Water pollution.
Identifiers: *Bacterioplankton, Phials.

Experiments with filtered water from lakes of different trophic character showed that water filtration changes the habitat bacteria: regular change in their morphological composition and 'pulsation' of heterotrophic assimulation take place. The Razumov-Ivanov method for determining bacterioplankton generation times gives no indication of bacterial reproduction rates in the water body since in the filtered water this rate does not remain constant for a long time.--Copyright 1975, Biological Abstracts, Inc.
W76-12319

DESTRUCTION OF ORGANIC MATTER IN GROUNDS OF KAPCHAGAI RESERVOIR, (IN RUSSIAN),
Akademiya Nauk Kazakhskoi SSR, Alma-Ata. Inst. of Microbiology and Virology.
N. K. Gulaya, and N. L. Tyuten'kova.
Mikrobiologiya. 43(2), p 316-320, 1974.

Descriptors: *Organic matter, Reservoirs, Phytoplankton, *Decomposing organic matter, Aerobic conditions, Anaerobic conditions.
Identifiers: *Kapchagai Reservoir(USSR).

The rate of destruction of organic matter was determined in soils of the Kapchagai Reservoir (USSR) during the 3rd year of its filling (May, July and Oct. of 1972). Aerobic decomposition of organic matter per day was 329 mg C/m2 in spring, 280 mg C/m2 in summer and 206 mg C/m2 in autumn. Anaerobic destruction of organic matter per day was 38% in spring, 62% in summer and 48.8% in autumn, of the total amount of mineralized organic matter. (Phytoplankton are mentioned.)--Copyright 1975, Biological Abstracts, Inc.
W76-12320

THE MERCURY CONCENTRATION IN EELS (ANGUILLA ANGUILLA) FROM THE ESTUARY OF THE GUADALQUIVIR RIVER AND 'ESTEROS' OF SALINES OF CADIZ BAY, (IN SPANISH),
Instituto de Investigaciones Pesqueras, Dadiz (Spain). Laboratorio de Investigaciones Pesqueras.
R. Establier.
Invest Pesq. 39(1), p 249-156, 1975.

Descriptors: *Mercury, *Eels, Estuaries, Europe, Bays, Rivers, Sediments, Salinity.
Identifiers: Anguilla-Anguilla, Esteros, Guadalquivir River(Spain), Mugil-Auratus, Mugil-Cephalus, *Bay of Cadiz(Spain).

The average concentration of total Hg (expressed on a wet weight basis) of eels from the estuary of the Guadalquivir River and from 'Esteros' of Salines from Cadiz Bay (Spain) was 0.27 ppm and 0.19 ppm, respectively. The levels of Hg in mullet (Mugil cephalus and M. aurata) were below 0.12 ppm. Concentration of Hg in sediment from Salines of Cadiz Bay was 0.12-0.18 ppm.--Copyright 1975, Biological Abstracts, Inc.
W76-12321

SOME ASPECTS OF FOAM AND SCUM MYCOFLORA IN THE RUNNING WATERS OF POLESYE AND STEPPE OF THE UKRAINIAN SSR, (IN UKRANIAN),
Akademiya Nauk URSR, Kiev. Instytut Botaniki.
I. O. Dudka, and N. O. Moshkova.
Ukr Bot Zh. 31(6), p 723-727, 1974.

Descriptors: *Foaming, *Fungi, Rivers, Streams, Forests.
Identifiers: *Polesye(USSR), Scum, Steppe, Ukrainian-SSR, *Micoflora, *Fungal spores.

Comparison between the complexes of fungal spores found in foam and scum of the running waters in Polesye and steppe of the Ukrainian SSR (USSR) and those found in the surface biotope of the running waters in forest-steppe and the Carpathians showed that the former differ in having less specific variety and fewer spores. The poorest specific composition and the fewest fungal spores are observed in the surface biotope of the steppe running waters. In the foam and scum of the steppe rivers and streams the spores of ground fungi were an essential quantitative component of the fungal complex, while in the surface biotope of the running waters in other botanicogeographical zones of the Ukrainian SSR the total quantitative content of the fungal spores was determined by the quantity of aquatic hyphomycetous conidia. The hydrological and hydrochemical factors affecting the formation of fungal spore complexes in neuston associations in the Polesye and steppe running waters are also discussed.--Copyright 1975, Biological Abstracts, Inc.
W76-12323

STUDIES ON THE PRODUCTIVITY OF THE KALEN-GO-STREAM IN CENTRAL AFRICA, (IN GERMAN),
Kiel Univ. (West Germany). Zoologisches Institut.
K. Boettger.
Arch Hydrobiol. 75(1), p 1-31, 1975.

Descriptors: *Productivity, *Streams, Africa, *Aquatic insects, Water pollution effects.
Identifiers: *Zaire.

Productivity studies were performed on a mountain stream at the Institut pour la Recherche Scientifique en Afrique Central (Republic of Zaire). A tent made of plastic and gauze erected over the stream, covered an area of 8.90 m2. From daily collections of all insects emerging from the stream, emergence was determined. Work in the field lasted from April 1972-July 1973.--Copyright 1975, Biological Abstracts, Inc.
W76-12324

DEVELOPMENT OF CERTAIN BLACK SEA FISHES IN SEA CONTAMINATED BY PETROLEUM PRODUCTS,
O. G. Mironov.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-237 904T, $3.50 in paper copy, $3.00 in microfiche. EPA Translation EPA-TR-31-75. September 1974, 9 p, 2 tab, 3 fig, 4 ref. Source publication not given.

Descriptors: *Marine fish, *Fish physiology, *Fish eggs, *Oily water, *Toxicity, *Bioassay, *Reproduction, Fry, Water pollution effects, Oil pollution, Oil spills, Zooplankton, Growth rates, Growth stages.
Identifiers: Engraulis enrasicholus, Scorpaena porcus, Crenilabrus tinca, *Black Sea.

A study was made of the development of the fertilized eggs of Engraulis enrasicholus ponticus Alex., Scorpaena porcus L., and Crenilabrus tinca L. in sea water containing 0.1-0.01 ml/liter petroleum, solar oil, and mazut. The different species sensitivity of the fishes to the petroleum products used was found. The damaging effect of these compounds (death of the organisms) was clearly indicated down to a concentration of 0.001 ml/liter. Lower concentrations of petroleum, solar oil, and mazut were also proved toxic for the hydrocarbionts. The consequences of this intoxication can be reflected not in the direct death of the roe or prelarvae, but in the later stages of development or in future generations. (Katz)
W76-12326

EFFECTS OF A WASTE OF 'PAPER KRAFT' ON THE BENTHIC ALGAL POPULATIONS IN N.W. SPAIN. 'STRESS' ON THE FUCACEAE STANDING CROP, (IN SPANISH),
Instituto de Investigaciones Pesqueras Vigo (Spain). Laboratorio de Investigaciones Pesqueras
F. X. Niell, and Y. J. Buela.
Investigacion Pesquera. Vol 40, No 1, p 137-149, 1976. 5 fig, 2 tab, 6 ref.

Descriptors: Aquatic plants, *Benthic flora, *Kraft mill, *Lignins, *Mussels, Industrial wastes, *Water pollution effects, Pulp and paper industry, Kelps, Biomass, *Pulp wastes, Standing crops, Bays, Plant populations, Mollusks
Identifiers: *Spain(Pontevedra Bay), Intertidal zonation, Mytilus, Fucus, Lignosulphonic residues.

Populations of intertidal fucaceae in the vicinity of a Kraft pulping waste discharge in Pontevedra Bay, Spain, show the effects of pollution. There is a total abiotic zone in the immediate vicinity of the discharge; farther on, a semi-biotic zone is found, and farther distant a zone with some eutrophic population characterized by an abundance of Mytilus and Ulvales. The biomass is lower near the discharge. There is a high negative correlation between lignosulphonic residues and biomass. (Katz)
W76-12327

A BIOENERGETICS-BASED MODEL FOR POLLUTANT ACCUMULATION BY FISH. SIMULATION OF PCB AND METHYL-MERCURY RESIDUE LEVELS IN OTTAWA RIVER YELLOW PERCH (PERCA FLAVESCENS),
National Research Council of Canada, Ottawa (Ontario). Div. of Biological Sciences.
R. J. Nortstrom, A. E. McKinnon, and A. S. W. deFreitas.
Journal of the Fisheries Research Board of Canada, Vol 33, p 248-267, 1976. 7 tab, 8 fig, 5 ref.

Descriptors: *Yellow perch, *Path of pollutants, *Growth rates, *Absorption, *Mathematical models, *Polychlorinated biphenyls, *Mercury, *Pesticide residues, *Pesticide kinetics, Metabolism, Fish physiology, Pesticides, Kinetics, Respiration, Seasonal, Temperature.
Identifiers: Perca flavescens, Bioenergetics, Bioaccumulation.

A pollutant accumulation model is developed which successfully predicts concentrations of PCB's and methylmercury in tissue of yellow perch (Perca flavescens). The model is based on pollutant biokinetics coupled to fish energetics. The expression for metabolic rate includes a growth dependent term for estimating the contribution to metabolism of seasonal and annual growth in each age-class. Pollutant clearance is related to body weight raised to the power of -.58 but is independent of metabolic rate. Under steady state conditions of chronic exposure, the predicted ratio of uptake to clearance is roughly constant at all weights, and the slope of a curve of log pollutant concentration in tissues vs. log body weight can be used to establish the exponent of body weight for clearance. (Katz)
W76-12329

DDT CAUSES CHANGES IN ACTIVITY AND SCHOOLING BEHAVIOR IN GOLDFISH,
New Jersey Coll. of Medicine and Dentistry, Newark. Dept. of Anatomy.
P. Weis, and J. S. Weis.
Environmental Research, Vol. 7, p 68-74, 1974. 1 fig, 2 tab, 25 ref.

Descriptors: *DDT, *Fish behavior, *Laboratory tests, *Water pollution effects, Schools(Fish), Social behavior(Animal), Pesticides, Metabolism, Analytical techniques, Behavior, Aquatic environment, Pesticides, Chlorinated hydrocarbon pesticides, Lethal limit.

ntifiers: *Sublethal effects, *Goldfish avior.

dfish were exposed to one part per billion DDT vater for 7 days, then placed in clean water. er 3 days of exposure, groups of five showed ificant increases in activity of individuals, ool size and angular deviation. In response to a nt stimulus, treated schools scattered further did not regroup as soon as did control schools. se effects were no longer evident 1 wk after were transferred to clean water. (Katz)
-12330

TE EFECTS OF CADMIUM ON ICTALU- PUNCTATUS (CATFISH),
as A and M Univ., College Station. Dept. of rinary Physiology and Pharmacology.
Smith, E. Hejtmanick, and B. J. Camp.
etin of Environmental Contamination and cology, Vol. 15, No. 3, p. 271-277, 1976. 1 fig, , 13 ref.

riptors: *Bioassay, *Cadmium, *Absorption, physiology, Laboratory tests, *Catfishes, ls, Analytical techniques, Pollutant identifi- n, Water pollution effects.
ifiers: Bioaccumulation, Magnification, ue analysis, *Hematology.

uptake and tissue distribution of cadmium in h (Ictalurus punctatus) was studied following sure of catfish to varying concentrations of ium and alterations in hematological con- nts resulting from this exposure were ex- ed. The cadmium concentrations found in the were in trace amounts and appeared to be in- dent of cadmium exposure. Liver and kid- accumulated cadmium with the amount of ium accumulated in the kidney increasing increased cadmium exposure. The greatest gical magnification of cadmium in the liver idney occurred at the lowest cadmium expo- level (12 x and 41 x, respectively). Con- ntly, tissue levels of cadmium cannot be cor- d with ambient cadmium levels. Exposure of h to cadmium did not produce signficiant dif- ces in hematological constituents between ol and test fish. (Katz)
2331

ACUTE SEPTICAEMIC DISEASE OF VN TROUT (SALMO TRUTTA) AND AT- IC SALMON (SALMO SALAR) CAUSED PASTEURELLA-LIKE ORGANISM,
s Veterinarhoegskole, Oslo.
stein, and G. L. Bullock.
l of Fish Biology, Vol. 8, No. 1, p. 23-26, tab., 6 ref.

ptors: *Fish diseases, *Fishkill, *Bacteria, n trout, *Atlantic Salmon, Fish physiology, ical techniques, Diseases, Animal patholo- lmonids, Salmon, Trout, Mortality, Water on effects, Pollutant identification.
iers: *Pasteurella, Septicaemic disease, pathogens, Pathogen identification, ay.

tions of the skin associated with haemorr- petechiae of liver and kidneys, were the gns of disease affecting salmon and brown n Norway. A death rate of 15-20 parts per d was estimated for the 5 month period of arch-August, although mortalities occurred out the year. Bacteriological examination, ng 36 isolates, suggested the causal organ- e a Pasteurella although the DNA homolo- nination gave a G.C. ratio of 55.6 parts per d which is high for Pasteurella as a group.

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EFFECTS OF COPPER ON SURVIVAL AND OSMOREGULATION IN MARINE AND BRACKISH WATER ISOPODS (CRUSTACEA),
Liverpool Univ., Port Erin (England) Dept. of Marine Biology.
M. B. Jones.
In: Proceedings 9th European Marine Biology Symposium, H. Barnes, ed., Aberdeen University Press, p. 419-432, 1975. 6 fig., 55 ref.

Descriptors: *Copper, *Salinity, Stress, *Mortality, Environmental effects, *Lethal limit, Brackish water, *Crustaceans, *Isopods, Sea water, *Toxicity, *Bioassay, Osmosis, Invertebrates, Metals, Water pollution effects, Laboratory tests, Animal physiology.
Identifiers: Sublethal effects, Synergistic effects, *Osmoregulation.

A concentration of 10 mg/l copper was highly toxic to marine and brackish water isopods at salinities ranging from 100-1 parts per hundred sea water; each species had over 50 parts per hundred mortality even at optimum conditions of salinity at the LT50 values decreased with decreased salinity. Mortality did not reach 50 parts per hundred in full sea water with 1 mg/l copper, but a decrease in salinity caused an increase in the toxicity of the metal and shortened the LT50 times. In the absence of copper, the marine species were able to survive in salinities from 100 parts per hundred to 40 parts per hundred sea water, and the brackish water forms from 100 parts per hundred to 1 parts per hundred sea water, by maintaining their haemolymph osmotic concentration above that of the outside sea water. 1 mg/l copper caused a significant lowering of this osmotic pressure, particularly in dilute salt solutions. This suggests that copper acts synergistically with salinity, and concentrations of copper that are sub-lethal at optimum conditions become increasingly toxic as environmental stress is increased. (Katz)
W76-12333

ACUTE TOXICITY OF PHOS-CHECK (TRADE NAME) 202 AND DIAMMONIUM PHOSPHATE TO FATHEAD MINNOWS,
Environmental Health Lab., Kelley AFB, Tex.
R. C. Inman.
Available from the National Technical Information Service, Springfield, Va 22161, as AD-A006 122, $4.00 in paper copy, $3.00 in microfiche. Report EHL(K)74-31, December, 1974. 3 tab., 1 fig., 13 ref.

Descriptors: *Toxicity, *Bioassay, Freshwater fish, *Ammonium compounds, Analytical technique, *Minnows, *Phosphates, Laboratory animals, Water analysis, Hydrogen ion concentration, Water pollution effects, *Pollutant identification.
Identifiers: *Fathead minnows, Static bioassay, Phos-Check 202, Di-ammonium phosphate, *Fire-retardants, Dynamic bioassay, 96 hr LC50.

Fathead minnows were exposed to diammonium phosphate (DAP) and PHOS-CHECK (Trade Name) 202 (PC202) during static and dynamic bioassays. In static bioassays the 96 hour LC50 of DAP was 155 mg/l. The 96 hour LC50 of PC202 was 1320 microliters of the fire-retardant slurry per liter. The DAP concentration in the PC202 slurry would have been 150 mg/l at the 96 hour LC50 concentration. The incipient LC50 based on dynamic bioassays was 1022 microliters slurry per liter. Based on EPA recommendations of unionized ammonia not exceeding 0.02 mg/l, the recommended limit for PC202 was 66 microliters slurry or 3 mg DAP per liter at pH 7.8. At higher pH values the DAP or PC202 recommended concentrations would be even lower. (Katz)
W76-12334

A REVIEW OF LITERATURE ON THE USE OF POTASSIUM PERMANGANATE (KMN04) IN FISHERIES,
Bureau of Sport Fisheries and Wildlife, Fayetteville, Ark. South Central Reservoir Investigations.
T. O. Duncan.
Report FWS-LR-74-14, March, 1974. 61 p., 4 tab., 154 ref.

Descriptors: *Toxicity, Freshwater fish, *Bioassay, *Fish diseases, Fish establishment, Fish farming, Fish handling facilities, *Fish hatcheries, *Fish parasites, *Aquaculture, *Reviews, *Bibliographies, Potassium compounds, Aquaria, Fish eggs, Fish sterilants, Parasitism, Algicide, Fungicide, Fisheries.
Identifiers: *Potassium permanganate, Literature reviews.

Potassium permanganate is one of the most widely used inorganic chemicals in the world. Since its first use in fish culture in 1893, potassium permanganate has been used: primarily as a disinfectant in fish hatcheries, aquaria, raceways, ponds, and water supplies; for removal of fish parasites; to reduce disease, or as a disease preventative, especially on wounds of fish; for detoxification of fish toxicants such as rotenone and antimycin; for fungus and algae control; and temporary oxygen depletion problems in ponds. In foreign countries, potassium permanganate is used for removal of parasites before the live fish is sent to market, as well as a disinfectant. Complete review of literature concerning potassium permanganate's use in fisheries is presented. (Katz)
W76-12335

QUALITY OF POTATOES GROWN ON FIELDS IRRIGATED WITH WASTEWATERS OF COAL-TAR CHEMICAL AND METALLURGICAL PLANTS, (IN RUSSIAN),
Kiev Inst. of Nutritional Hygiene (USSR).
L. A. Stempkovskaya, L. R. Polishchuk, and N. M. Barabanova.
Gig Sanit. 11, p 97-98, 1974.

Descriptors: *Potatoes, *Soil disposal fields, Irrigation practices, Chemical wastes, *Industrial wastes, Organic wastes, Nitrites, Ammonia, Chlorides, Microbial degradation, Sulfides, Water reuse.
Identifiers: Cyanides, Cyanates, Thiocyanates.

Potatoes grown on experimental plots irrigated with wastewaters from coal-tar chemical and metallurgical plants which contained large amounts of organic and inorganic chemicals were studied. Nitrites, thiocyanates, ammonia and chlorides accumulated in the potatoes during growth on the plots. All organic ingredients, cyanides and sulfides of the wastewaters were absent in the potatoes. The absence of these substances can be explained by their breakdown in the soil and in the plant itself under the effect of various factors (microbiological, physicochemical, etc.)--Copyright 1975, Biological Abstracts, Inc.
W76-12355

WATER QUALITY AND WASTE DISPOSAL IN MONTANA,
Montana State Univ., Bozeman. Dept. of Botany and Microbiology.
J. W. Jutila.
Montana Agriculture - Focus on Improving the Environment, December 3-4, 1970, p. 61-68. 1 fig, 2 tab.

Descriptors: *Water quality, *Waste disposal, *Montana, *Water pollution sources, *Eutrophication, *Nitrates, *Phosphates, *Water pollution effects, Detergents, *Farm wastes.

Many Montana rivers and streams are being polluted with human and agricultural wastes, even at their headwaters, to the extent that the quality of

water of the Missouri River along its entire length may be seriously compromised. Surface waters are becoming so fertilized by man's activities that objectionable growths of water flora appear in abundance. In 1957, several teams of investigators from the Montana State University investigated the nature of the pollution problem in the East Gallatin River and its tributaries. Phosphates and nitrates, coming from sanitary sewer systems, synthetic detergents, burial of solid wastes, and excreta of farm animals were the primary factors causing undesirable water changes. Federal and state agencies have sponsored studies on the problem and solution of agricultural and human waste disposal pollution, emphasizing water quality studies. But far more research is required on the identity, fate, and biological and non-biological transformation of these pollutants. (Hisle-East Central)
W76-12359

HYGIENIC EVALUATION OF POTATOES GROWN IN SOIL IRRIGATED WITH EFFLUENTS FROM COKING AND CHEMICAL PLANTS OF THE DONETS COAL BASIN, (IN RUSSIAN),
Kiev Inst. of Nutritional Hygiene (USSR).
N. M. Vorob'eva, S. G. Vasiliu, and L. T. Lukashevich.
Vopr Pitan. 4, p 49-53, 1974.

Descriptors: *Potatoes, Effluents, *Industrial wastes, Rodents, *Soil disposal fields, Soil disposal fields, Irrigation practices, *Chemical wastes, Public health, Water pollution effects, *Water reuse.
Identifiers: *Donets Coal basin(USSR), *Coal processing wastes.

Experiments with albino rats on the influence of protracted feeding (8 mo.) of potatoes from plots irrigated with effluents from coking and chemical plants of the Donets coal basin (Voroshilovograd region) (USSR) revealed some functional disorders in the liver and reduced weight gain. The chemical composition of potatoes grown on plots irrigated with undiluted effluents differed somewhat from control samples.--Copyright 1975, Biological Abstracts, Inc.
W76-12369

COMPARISON OF ECOLOGICAL IMPACTS OF POSTULATED OIL SPILLS AT SELECTED ALASKAN LOCATIONS. VOLUME I. INTRODUCTION, SUMMARY, METHODOLOGY, EVALUATION AND APPENDICES,
Mathematical Sciences Northwest, Inc., Bellevue, Wash.
J. S. Isakson, J. M. Storie, J. Vagners, G. A. Erickson, and J. F. Kruger.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A017 600, $16.25 in paper copy, $3.00 in microfiche. U.S. Coast Guard Final Report No. USCG-D-155-75, June 1975. 614 p, 5 append. DOT-CG-42913-A.

Descriptors: *Continental Shelf, *Alaska, *Environmental effects, *Water pollution effects, *Oil spills, *Oil pollution, Resources development, *Weathering, Treatment, Water resources, Marine animals, Marine plants, Invertebrates, Fish, Vegetation, Dispersion, Marine fish.
Identifiers: *Outer Continental Shelf, *Ecological impact, *Environmental impact, Containment.

A ranking of potential environmental impact for spills of crude oil, diesel-2, bunker C, and gasoline in amounts ranging from 100 to 50,000 barrels was made for specific sites at Yakutat Bay, Valdez Harbor, Valdez Narrows, Drift River Channel, Port Graham, Kamishak Bay, Unimak Pass, Port Noller, Kvichak Bay, St. Matthew Island, Offshore Prudhoe, Onshore Prudhoe, Nome, Cape Blossom Channel, Colville River, Yukon River, and Denali Fault. Spills were assumed to disperse from inertial, viscous, surface tension, wind and current forces. Most probable wind and current conditions were utilized. Sites were characterized in terms of eight species habitats. Most probable cases were evaluated. A rating system was devised to characterize the impact based upon estimated species abundance, importance of species, and the impact of oil on such species over the short and long term. Impacts were estimated with the use of three-dimensional matrices. The highest impact ratings were obtained for spills at Port Graham, Valdez Narrows, Unimak Pass, and the Yukon River Crossing, assuming no spill cleanup. The same five locations dominated the impact rating where containment/cleanup were assumed to take place. Data gaps were noted and future studies are recommended. (Sinha-OEIS)
W76-12379

TOXIC EFFECTS OF OIL DISCHARGED FROM SHIPS,
Exxon Research and Engineering Co., Linden, N.J. Government Research Labs.
J. W. Frankenfeld, J. J. Elliott, R. E. Bentley, and B. H. Sleight, III.
Available from the National Technical Information Service, Springfield, VA 22161 as AD/A-022 902, $6.00 in paper copy, $3.00 in microfiche. U.S. Coast Guard Final Report No. USCG-D-16-75, December 1975. 138 p, 22 fig, 48 tab, 55 ref, 2 append. DOT-CG-51073-A.

Descriptors: *Water pollution effects, *Environmental effects, *Oil spills, *Oil pollution, *Toxicity, Fish, Shellfish, *Water pollution effects, Freshwater fish, Sea water, Shrimp, Minnows, Continental Shelf.
Identifiers: *Outer Continental Shelf, Biological effects, Fathead minnows, Mimmichog.

A study was conducted to determine the portions of six petroleum products which are dispersed and dissolved in water under specified conditions and the toxic effects of both the dissolved and the dispersed-plus-dissolved fractions on selected test organisms. The oils employed included: a Kuwait and a West Texas Crude, a marine diesel fuel, Navy Distillate and Navy Special fuel oils and a 9250 lubricating oil. The test organisms employed were the fathead minnow (Pimephales promelas), mimmichog (Fundulus heteroclitus) and the brine shrimp (Artemia salina). The effects of time, temperature and salinity were investigated. In addition, the maximum solubility of each test oil in fresh water was determined by means of partitioning conditions. Two types of analytical methods, total organic carbon determinations (TOC) and an extraction-infrared procedure were employed. Maximum observed solubilities in fresh water ranged from 3.1 ppm for the 9250 lube oil to 35 ppm for the light Kuwait crude. Solubilities in salt water were lower than fresh water by a factor of 2-4 while reducing the temperature from 77F to 57F had a lesser effect. Most fresh water dispersions settled rapidly for 48 hours and then reach near equilibrium; salt water and cold temperature dispersions settled faster. (Sinha-OEIS)
W76-12380

FIRST STUDIES ON THE ZOOPLANKTON OF THE LOTIC WATERS OF THE MIDDLE PARANA RIVER BASIN, (IN SPANISH),
J. C. Paggi, and S. J. Depaggi.
Physis Secc B Aguas Cont Org. 33(86), p 91-114, 1974.

Descriptors: *Zooplankton, *Lotic environment, *South America, River basins, Ecology, Salinity, Water temperature, Hydrogen ion concentration, Copepods, Turbidity, Crusteoceans.
Identifiers: *Parana River basin(Argentina).

The information obtained in an early stage of a series of investigations about the ecology of zooplankton in the Middle Parana River (Argentina) is analyzed. The objective was to study the community structure and evolution of zooplankton for 17 mo. and to estimate the relative importance of some environmental parameters in this process. Three places were sampled monthly between the cities of Parana and Santa Fe. Total salinity, pH, temperature, turbidity and hydrological regime were studied. The community contains 90 spp. made up of Rotatoria, Copepoda and Cladocera, being almost all true planktonic species while littoral and benthic ones are scarce. The communitary structure is very similar to that of regional lenitic bodies of water, although the diversity of Copepoda is somewhat less. Some species not recorded in regional lenitic waters are found in these rivers. The environmental parameters showing the highest correlation to the quantitative fluctuations of zooplankton are turbidity and hydrological regime, principally the former.--Copyright 1975, Biological Abstracts, Inc.
W76-12382

THE PASSAGE OF TRITIUM WITH DRINKING WATER INTO THE BODY OF RATS AND THEIR PROGENY IN A CHRONIC EXPERIMENT, (IN RUSSIAN),
Y. I. Moskalev, A. M. Lyaginskaya, and A. G. Istomina.
Gig Sanit. 11, p 35-37, 1974.

Descriptors: *Tritium, *Potable water, Rodents, *Digestion, Absorption, Toxicity, Water pollution effects.
Identifiers: Tritium oxide.

The kinetics of 3H accumulation in the body of rats (male and female), pregnant rats and rattlings during the chronic entry of tritium oxide with the drinking water was studied. When mixed feedstuffs were given, the 3H contents in the water phase of the body of adult rats amounted to 42-44% of its concentration in the drinking water, in the water phase of rattlings on the 3rd-15th day, it equaled 28%. No placental barrier existed for tritium oxide in the body of pregnant rats.--Copyright 1975, Biological Abstracts, Inc.
W76-12392

PETROLEUM PROCESSING WASTES (LITERATURE REVIEWS),
Weston (Roy F.), Inc., West Chester, Pa.
For primary bibliographic entry see Field 5D.
W76-12415

GROUND-WATER AND SURFACE-WATER RELATIONSHIPS IN THE GLACIAL PROVINCE OF NORTHERN WISCONSIN SNAKE LAKE,
Adolph Coors Co., Golden, Colo.
For primary bibliographic entry see Field 5G.
W76-12444

AN HISTORICAL PERSPECTIVE OF NUTRIENT INPUTS AND TROPHIC STATES AS DEDUCED FROM CAYUGA LAKE SEDIMENTS,
Cornell Univ., Ithaca, N. Y. Dept. of Natural Resources.
R. T. Oglesby, and J. Z. McKenna.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 843, $3.50 in paper copy, $3.00 in microfiche. Cornell University Center for Environmental Research Technical Completion Report, September, 1976. 15 p., 5 fig, 2 tab., 30 ref. OWRT A-054-NY(1), 14-31-0001-5032.

Descriptors: Stratigraphy, Clays, Absorption, *Nutrients, History, Pigments, Chlorophyll, Biodegradation, Paleolimnology, Lakes, *Phosphorus, Sediments, *Lake sediments, *New York, *Bottom sediments, *Trophic level, Organic matter, Primary productivity, Cores, Sampling, *Profundal zone.
Identifiers: *Cayuga Lake(NY).

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m cores were collected from the profundal of Cayuga Lake and stratigraphically zed for phosphorus, organic and pigment nts; and a geological time scale for their ition was determined. Precultural sediments characterized by high variability of most eters. Those deposited since the mid 19th y had properties consistent with the hesis that cultural influences have produced ked increase in primary productivity, espe- during the past several decades. Evidence lso obtained supporting the postulate that horus absorbed to clay particles is of limited bility to phytoplankton. For postcultural nts variations in P content and chlorophyll lation products or organic matter were in- y related.
2463

CT OF A MAINSTREAM IMPOUNDMENT HE FISH FAUNA OF BIG WALNUT K A SCIOTO RIVER TRIBUTARY IN RAL OHIO,
tate Univ., Columbus. Dept. of Zoology.
mary bibliographic entry see Field 6G.
2465

OBIOLOGICAL TRANSFORMATION OF ON NITROGEN, SULFUR, IRON, PHORUS AND CALCIUM COMPOUNDS KE RESERVOIRS, (IN POLISH),
Association of Sanitary Engineering and logy, Warsaw.
olak.
oda Tech Sanit. 47(2), p 39-42, 1973.

tors: Microbiology, Carbon, *Nitrogen, Iron, *Phosphorus, Calcium compounds, disposal, Lakes, Water pollution effects, g nutrients, *Productivity, *Sewage l, Cycles, Photosynthesis, Phytoplankton.

l of agricultural, communal and industrial into lakes can result in far reaching leading to atrophy of the water body. ns differ in different types of lakes. Two ing processes can be distinguished in the C ynthesis of organic substance from CO2 neral compounds and mineralization or ion. The N cycle is closely linked with ion of organic substances in the ankton photosynthesis process. The P closely linked with the Fe and S cycles. these cycles is presented in graphic form lained. Productivity of lakes is greatly in- by the transformations.--Copyright 1975, al Abstracts, Inc.
94

IC FLUOROSIS IN PUNJAB: I. AL ASPECT,
nent Medical Coll., Patiala (India). Dept. ine.
y, S. Prasad, R. Sharma, and R. Chander. 6(1), 4-18. 1973.

ors: Asia, X-ray analysis, Surveys, health, *Human diseases, *Fluorides, ation.
s: *Endemic fluorosis, *Punjab(India).

ive surveys of 10 villages from a known emic fluorosis area of Punjab (India), ne Bhatinda and Sangrur Districts, an ef- made to examine each individual and to ys on as many as possible. A very high in- f dental (44-81%) and skeletal (2.8-81%) was observed but no strict correlation he 2 manifestations could be established. and neurological fluorosis occurred re frequently in men than in women. The tors determining fluoride toxicity were de concentration in drinking water and ion of exposure to this hazard. Yet in identical concentrations of fluoride in water, variations in the incidence of the disease occurred. They were related to other chemical constituents of drinking water which are protective against the development of fluorosis such as Mg, Ca and total hardness. Physical stress which was chiefly responsible for the severity of disease in men was also responsible for the neurological complication. Mal-nutrition played no etiological role in this disease. Food grown in the fluorotic soil did not provide a significant quantity of fluoride.--Copyright 1973, Biological Abstracts, Inc.
W76-12500

PHOSPHATE RELEASE AND SORPTION BY LAKE MOHEGAN SEDIMENTS,
City Coll., New York. Dept. of Civil Engineering.
J. Fillos, and H. Biswas.
Journal of the Environmental Engineering Division, Proceedings of the Society of Civil Engineers, Vol. 102, No. EE2, p 239-249, April 1976.

Descriptors: *Environmental engineering, *Eutrophication, *Lakes, *Phosphorus, *Sediments, Lake basins, Water management(Applied), Water quality, Sorption, Aerobic conditions, Anaerobic conditions, Water pollution effects.

The release rate of phosphorus from lake sediments to the overlying water was measured in a laboratory experiment. The sediments were from Lake Mohegan, a eutrophic lake in northern Westchester County, New York. The sorption capacity for phosphorus of Lake Mohegan sediments depends on the oxygen concentration in the overlying water. When the phosphate concentration in the overlying water is high, above 1-2 mg/1, the sediments will sorb phosphorus from the overlying water under both aerobic and anaerobic conditions. Below this phosphate value, the sediments will release phosphorus under anaerobic conditions while they will sorb phosphorus under aerobic conditions. (Bell-Cornell)
W76-12512

A EUTROPHICATION MODEL FOR A LAKE,
Royal Danish School of Pharmacy, Copenhagen.
S. E. Jorgensen.
Ecological Modelling (International Journal on Ecological Modelling and Engineering and Systems Ecology) Vol. 2, No. 2, p 147-165, June 1976. 9 fig, 11 tab, 22 ref.

Descriptors: *Ecosystems, *Lakes, *Mathematical models, *Eutrophication, *Waer quality, Phytoplankton, Kinetics, Biomass, Waste water treatment, Equations, Systems analysis, Simulation analysis, Forecasting, *Model studies, Path of pollutants.

Different lake models were tested against measured values. It was found that a model based upon phytoplankton population dynamics gave a better description than a model based upon Monod's kinetics. The calibration of the model showed that it was necessary to use a recently developed submodel for sediment-water nutrient exchange. Furthermore, the work showed that it was essential to include in the model three trophic levels, denitrification, a time dependent nitrogen input and Steele's expression for the grazing rate. A prediction for different waste water treatment alternatives was worked out. (Bell-Cornell)
W76-12515

LARGE SCALE SYSTEMS APPROACH TO ESTUARINE WATER QUALITY MODELLING WITH MULTIPLE CONSTITUENTS,
Texas Univ. at Austin. Dept. of Electrical Engineering.
For primary bibliographic entry see Field 5B.
W76-12517

AN INTERDISCIPLINARY MATHEMATICAL MODEL APPLIED TO THE SOUTHERN BIGHT OF THE NORTH SEA,
Liege Univ. (Belgium). Institut de Mathematique.
For primary bibliographic entry see Field 5B.
W76-12518

DOCUMENTATION OF SELECTED CONSTRUCTS AND PARAMETER VALUES IN THE AQUATIC MODEL CLEANER,
National Oceanic and Atmospheric Administration, Ann Arbor, Mich. Great Lakes Environmental Research Lab.
D. Scavia, and R. A. Park.
Ecological Modelling, (International Journal on Ecological Modelling and Engineering and Systems Ecology), Vol. 2, No. 1, p 33-58, March 1976. 10 fig, 6 tab, 58 ref.

Descriptors: *Aquatic environment, *Model studies, *Simulation analysis, *Zooplankton, *Phytoplankton, Phosphorus, Nitrogen, Behavior, Temperature, Biomass, Nutrients, *Lakes, Systems analysis, *New York.
Identifiers: Consumption, Food, Process rates, Population-age structure, *Lake George(NY).

Process representations critical to the phytoplankton and zooplankton submodels are described. These include constructs for: light- and nutrient-limitations and their interaction, temperature, consumption, and population-age structure. Values for key parameters are documented with reference to the literature on aquatic ecology and ecological modelling. Time-course relationships of the processes affecting the phytoplankton, zooplankton, phosphorus and nitrogen compartments are presented and discussed. These serve as additional documentation and are an important result of modelling synthesis. (Bell-Cornell)
W76-12519

ON THE POLLUTION OF WATER OF SOME RIVERS IN THE KASUMIGAURA LAKE BASIN, (IN JAPANESE),
Ibaraki Univ., Mito (Japan). Faculty of Agriculture.
For primary bibliographic entry see Field 5B.
W76-12568

GROWTH AND DISSIPATION OF PHYTOPLANKTON IN CHESAPEAKE BAY: I. RESPONSE TO A LARGE PULSE OF RAINFALL,
Johns Hopkins Univ., Baltimore, ,Md. McCollum-Pratt Inst.
M. E. Loftus, D. V. Subba Rao, and H. H. Seliger.
Chesapeake Sci. 13(4), p 282-299, 1972.

Descriptors: *Phytoplankton, *Chesapeake Bay, *Rainfall, Sampling, *Fluorescence, *Eutrophication, Nutrients, Bays, Dinoflagellates, Methodology, *Plant growth, Dissipation, Pollutant identification.

Approximately 90 km2 of Chesapeake Bay contiguous with the Severn, South, Rhode and West Rivers were surveyed by in vivo chlorophyll fluorescence and captured samples following a large pulse of rainfall in summer, 1971. The growth and subsequent dissipation of blooms containing chlorophyll a concentrations up to 40 X pre-bloom values were completed within 21 days. A distinction is made between the blooms produced by nutrient pulses and dinoflagellate blooms normally observed in the fall. In the former, these is a complete change of phytoplankton relative species composition. The latter is a phototactic segregation of species already existing within the water column. The methodology is presented and a mathematical description is attempted.--Copyright 1973, Biological Abstracts, Inc.
W76-12572

SCHISTOSOMIASIS AND OTHER HUMAN PARASITOSES OF LAKE LINDU IN CENTRAL SULAWESI (CELEBES), INDONESIA,
M. D. Clarke, W. P. Carney, J. H. Cross, P. Hadidjaja, and S. Oemijati.
Am J Trop Med Hyg. 23(3), p 385-392, 1974.

Descriptors: *Animal parasites, *Human diseases, Asia, *Parasitism, Lake basins, Water pollution effects.
Identifiers: Ascaris-Lumbricoides, Brugia-Malayi, Celebes, Chilomastix-Mesnili, Echinostoma-Lindoense, Endolimax-Nana, Entamoeba-Coli, Entamoeba-Hartmanni, Entamoeba-Histolytica, Enterobius-Vermicularis, Giardia-Lamblia, Hymenolepis-Diminuta, Iodamoeba-Butschlii, Necator-Americanus, Plasmodium-Falciparum, Plasmodium-Vivax, Schistosoma-Japonicum, *Schistosomiasis, Strongyloides-Sterscoralis, Sulawesi, Trichuris-Trichiura, *Lake Lindu(Indonesia).

The isolated Lake Lindu Valley of Central Sulawesi is the only reported Indonesian focus of oriental schistosomiasis. In April 1972, a parasitological survey involving over 1400 people was conducted in the valley's 4 villages. Schistosoma japonicum infections were detected in 37.9% of all Lindu people by direct and formalin-ether concentration examinations of stools: 57.1% in Anca, 42.4% in Tomado, 30.0% in Langko, and 11.7% in Puroo. Peak prevalences of schistosomiasis were reached in the 2nd decade of life and remained high thereafter among both male and female populations. Prevalence of other helminthic parasites are reported as follows: Hymenolepsis diminuta, <0.1%; Strongyloides stercoralis, 0.2%; Enterobius vermicularis, 0.8%; Trichuris trichiura, 8.8%; Ascaris lumbricoides, 15.2%; and hookworm (Necator americanus), 69.6%. No Echinostoma lindoense infection was detected. Intestinal protozoa including Entamoeba coli, Giardia lamblia, Endolimax nana, Entamoeba histolytica, Iodamoeba butschlii, Entamoeba hartmanni and Chilomastix mesnili were also encountered. In blood smears collected from 1348 people, Brugia malayi microfilariae were detected in 5.4% of the population, and Plasmodium vivax and Plasmodium falciparum in 2.5%. Filariasis was more frequent in older age groups, while most malaria infections were found in Lindu residents 10 yr old or younger.--Copyright 1974, Biological Abstracts, Inc.
W76-12573

HYDROCARBON RESIDUES IN IVORY COAST WATERS,
D. Binet, and E. Marchal.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-237 797-T, $3.50 in paper copy, $3.00 in microfiche. Report EPA-TR 69-75, August 1974, 9 p. 4 tab. (Transltion).

Descriptors: *Coastal areas, *Benthos, *Atlantic oil, *Oil pollution, *Oily wastes, *Waste water disposal, International waters, *Marine fish, Commercial fish, *Fish eggs, *Fish reproduction, *Fish harvest, Fisheries, *Organic compounds.
Identifiers: *Pelagic fish, *Tar globs, *Sardinella, Sardines, *Ivory coast waters, Stomach analysis, Fishery decline.

For some years, the beaches of Ivory Coast have become more and more polluted by hydrocarbon residues. In addition, plankton net hauls have shown that the quantities of hydrocarbons in suspension in sea water are far from being negligible and generally more important in shallow water near the coast. The presence of oil in the stomachs of pelagic fish and the scarcity of eggs and larvae of these fish suggest the hypothesis that the decrease in the yield of these fish in Ivory Coast waters may at least partially be due to this oil. The authors suggest that strong action should be taken in order to force oil tankers to respect international rules concerning tank cleaning (at a minimum distance of 100 miles offshore) until better cleaning methods are employed. (Katz)
W76-12579

THE EUTROPHICATION OF TITI LAKE AND ITS CONSEQUENCES FOR THE POPULATION OF DYNAMICS OF ZOOPLANKTON: 2, (IN GERMAN),
Universidad Austral de Chile, Valdivia. Instituto Zoologio.
E. Szymanski-Bucarey.
Arch Hydrobiol Suppl. 47(2), p 167-238, 1974.

Descriptors: *Eutrophication, Europe, Lakes, *Zooplankton, *Sewage, *Nitrates, *Phosphorus, Nutrients, Silica, Diatoms, Anabaena, Phytoplankton, Rotifers.
Identifiers: Asterionella-Formosa, Cyclops-Abyssorum, Diaphanosoma, Fragilaria-Cortonensis, Leptodora-Kindtii, Mixodiaptomus-Laciniatus, *Titi Lake(West Germany).

Lake Titi, a moraine-dammed lake in the upper Black Forest of (West) Germany, is naturally oligo-dystrophic but is now eutrophic, owing to sewage input. Observations were made between May, 1968-Nov., 1970, during a critical transition in the eutrophication of the lake. The inflow from the brook stratifies in the lakes from June until Nov. In late autumn it provides O2 to the deep hypolimnion before the full circulation sets in. The annual cycle of concentrations of various chemical components in the brook is due to variations of the water supply and in the amount of sewage. Alkalinity, pH, Ca, Mn and silicate concentrations were all approximately the same as reported in earlier works. Nitrate concentration, however, had doubled, and phosphate levels were 10 times greater than before. The elevated nutrient levels were due to the sewage. Silicate uptake by diatoms has practically doubled in comparison to earlier readings. In 1969, Asterionella formosa was the dominant form of phytoplankton. In 1964 Asterionella was evident in quantity only during spring and fall. In 1970 an extreme growth of Fragilaria cortonensis (July-Aug.) was followed by a bloom of Anabaena (Sept.-Oct.). The population curves of the most important species of planktonic rotifers, Cladocera and Copepoda were followed for 3 yr (1968-70). Leptodora kindtii appeared in the Titisee in 1969. The Diaphanasoma population had strongly decreased since eutrophication set in. The population dynamics of Mixodiaptomus laciniatus and Cyclops abyssorum were analysed. (See also W76-07281)--Copyright 1975, Biological Abstracts, Inc.
W76-12594

METABOLIC RATES OF ARCTIC LAKES,
Atlantic Biological Station, St. Andrews (New Brunswick).
H. E. Welch.
Limnol Oceanogr. 19(1), p 65-73, 1974.

Descriptors: *Arctic, *Canada, Lakes, *Respiration, Winter, Turbidity, Drainage basins, *Productivity, Analytical techniques, *Metabolism, Fjord.
Identifiers: Cornwallis Island(Canada), Plant cover, *Arctic lakes, Disko Fjord(Greenland).

A technique for calculating the respiration rates of arctic lakes during winter is presented. Respiration rates range from a low of 30 g O2 m-2 yr-1 at Resolute, Cornwallis Island (Canada), to over 200 at Disko Fjord, Greenland, but a general range of 40-70 can be expected at 75 N latitude. Differences in lake productivity are tentatively ascribed to variations in turbidity and plant cover in the drainage basin.--Copyright 1974, Biological Abstracts, Inc.
W76-12602

HARMLESSNESS OF GRAIN GROWN SEWAGE FARMS, (IN RUSSIAN),
Rostov-na-Donu Gosudarstvenni Meditsinskii stitut (USSR)
Y G Novoderzhkina, T. V Kigel, and E V Makarenko.
Vopr Pitan. 2, p 86-88, 1974.

Descriptors: *Sewage, *Wheat, Irrigat Rodents, Effluents, Laboratory animals, Ch cal wastes, Industrial wastes

Experiments lasting 1 1/2 yr were conducte rats and rabbits to study the effect of wheat grown on sewage farms irrigated with co tionally pure sewage containing Ca, Mg, Na sulfates, chlorides, toluene, petroleum produ caprolactam and formaldehyde from a chem plant. The general health of the animals, cond of the hair, motor activity, change of body we and relative weight of organs, rectal tempera enzyme spectrum of the blood and liver ti protein and carbohydrate metabolism and ment-producing function of the liver were d mined. Feeding grain grown on sewage farm parently does not cause any changes in labora animals.--Copyright 1975, Biological Abstr Inc.
W76-12645

5D. Waste Treatment Processes

ENVIRONMENTAL FACTORS INFLUENC ISOLATION OF ENTEROVIRUSES FROM LUTED SURFACE WATERS,
New Hampshire Univ., Durham. Dept Microbiology.
For primary bibliographic entry see Field 5A.
W76-12171

TIME PARAMETER EVALUATION IN F FLOCCULANT DESTABILIZATION,
New Mexico State Univ., University Park. of Civil Engineering.
B. F. Duff, and W. A. Barkley.
Available from the National Technical Inf tion Service, Springfield, Va 22161, as PB-25 $5.50 in paper copy, $3.00 in microfiche. Mexico Water Resources Research Institute Cruces, WRRI Report No. 062, March 1976, 34 fig., 9 tab., 34 ref. append. OWRT A NMEX (2).

Descriptors: *Flocculation, *Waste Water ment, *Chemical precipitation, Colloids, wastes, Zeta potential, Turbidity, Pol trolytes.
Identifiers: Latex, Aluminum sulfate, Dual f lants.

Research was conducted to obtain an op time differential between the addition of dua culants, aluminum sulfate and polyelectroly a colloidal suspension. A synthetic co suspension, latex, was used in order to achie best available reproducibility. Both cation anionic polyelectrolytes were examined in c tion with aluminum sulfate (alum). To si tests, pH, ionic strength, and temperatur held constant. The dependent paramete destabilization measurement were turbidity solids, zeta potential, and A13+ concent Various alum concentrations, polyelectroly centrations, and time intervals were exa For the cationic polyelectrolyte, the optimu for addition was dependent upon amount o used, but the cationic polyelectrolyte sho ways be added after the alum. The optimu for the anionic polyelectrolyte was 5 minute alum had been added to the system. Th suspension gave reproducible results dur testing period. The use of zeta potential m ments along with the turbidity and total proved useful in evaluating what happened suspension. Turbidity by itself could be n

g. The time difference between the addition of imary and secondary flocculants affects the effi-ncy of coagulation in a synthetic colloidal stem, this conclusion is probably at least qualita-ely valid for real colloidal systems. Water treat-nt plants should attempt to evaluate this time ctor to improve water treatment without addi-nal chemical cost. (See also W76-12212) (Hain-w Mexico State)
76-12211

PRODUCIBILITY EVALUATION OF THE OCCULATION OF A SYNTHETIC LATEX LLOIDAL SYSTEM,
w Mexico State Univ., University Park. Dept. Civil Engineering.
Wu, and W. A. Barkley.
ailable from the National Technical Informa-n Service, Springfield VA 22161, as PB-257 737, 50 in paper copy, $3.00 in microfiche. New xico Water Resources Research Institute, Las ices, WRRI Report No. 062, March 1976, 62 p., ig., 8 tab., 33 ref. OWRT A-047-NMEX(2).

scriptors: *Colloids, *Waste water treatment, nemical precipitation, Zeta potential, Turbidity, drogen ion concentration, Polyelectrolytes, agulation.
ntifiers: *Coagulants, *Alum, Total solids, ex.

reproducibility of a series of jar tests on col-al destabilization and the performance of alum cationic polyelectrolyte were investigated. ng synthetic latex suspension as a model col-al suspension, ten test conditions based on pH, onic strength, alum, and cationic polyelec-yte destabilization were investigated. Three de-dent variables (zeta potential, total solids and idity) were used to express the destabilization he colloidal suspension. The results were eval-d by statistical analysis. Alum performed er than the cationic polyelectrolyte. Alum and onic polyelectrolyte used jointly as primary gulants gave the most reproducible result. (See W76-12211) (Hain-New Mexico State)
6-12212

ERGY COSTS OF WASTEWATER REUSE,
zona Univ., Tucson. Economic and Business earch.
. Pingry.
ilable from the National Technical Informa-Service, Springfield, Va 22161, as PB-257 518, 0 in paper copy, $3.00 in microfiche. Comple-Report, Sept. 1, 1976. 11 p, 3 tab, 6 ref. OWRT 58-ARIZ(1). 14-34-0001-6003.

criptors: Econometrics, *Estimated costs, ter reuse, *Regression analysis, Cost analysis, tment facilities, Arizona, *Waste water treat-t.
tifiers: *Wastewater resue, *Energy Costs).

ctions were estimated using regression niques which relate cost and energy use of ewater treatment plants to measures of flow, ment load and level of use. The sample of s is drawn from Arizona and consists of s which are or could be engaged in waste-r reuse. The resulting functions are used to ate net water gain from reuse. In addition ds on the value of water relative to energy h are necessary for reuse to be economical alculated.
-12215

OSAL ALTERNATIVES FOR INTERMIT-T SAND FILTER SCRAPINGS UTILIZA-AND SAND RECOVERY,
Center for Water Resources Research, n.
Elliott, D. S. Filip, and J. H. Reynolds.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 492, $4.50 in paper copy, $3.00 in microfiche. Utah Water Research Laboratory Publication, PRJER033-1, June 1976. 54 p, 40 fig, 42 tab, 41 ref, 3 append. OWRT A-033-UTAH(1). 14-34-0001-6046.

Descriptors: Filtration, Lagoons, Algae, Irrigation, Soils, *Oxidation lagoons, *Waste water disposal, *Cost analysis, *Filters, Sands, Bioassay, Lysimeters, Fertilizers, Alternative costs, *Utah, Water reuse.
Identifiers: Logan(Utah), *Sand filters, *Land application, Soil conditioners.

A three phase study is used to develop disposal alternatives and cost analysis for algae laden sand scrapings removed from intermittent sand filters used to polish wastewater lagoon effluent. Phase I, Irrigation Technique, explores the feasibility of supplying sufficient water to sand scrapings to leach out entrapped material. Details of removal with amount of water applied are presented. Phase II, Soil Application, tests with lysimeters soil response to application of the algae laden sand material. Physical and chemical parameters are not markedly altered where algae laden sand is applied to the soil surface. Phase III, Plant Bioassays, grew tall fescue on lysimeters which had algae laden sand scrapings applied and compared this growth response with lysimeters having no additives to a clay soil and lysimeters having ammonium nitrate added as fertilizer. Results indicate that all three disposal alternatives are viable recourses for sewage sand filter sand deposition and utilization. Cost analysis indicates that an irrigation technique may be less expensive.
W76-12219

SANITARY EVALUATION OF THE CONDITIONS OF SOIL DECONTAMINATION OF WASTEWATERS OF HYDROLYSIS PLANTS OF THE UZBEK SSR, (IN RUSSIAN),
Uzbekskii Nauchno-Iddledovatelskii Institut Sanitarii, Gigieny i Profzabolevanii, Tashkent (USSR).
I. Usmanov.
Gig Sanit. 4, p 108-109, 1974.

Descriptors: *Water reuse, *Irrigation, Hydrolysis, Water pollution sources, *Cotton, Nitrification, Self purification, Dilution, Crop production, Bacteria, Soils, Treatment facilities.
Identifiers: Uzbek-SSR.

Irrigation of soils with the wastewaters of the Yangiyul biochemical (hydrolysis) plant in the Uzbek SSR in various dilutions in laboratory conditions did not have an adverse effect on processes of nitrification and bacterial self-purification; field experiments showed that irrigation with wastewater in a dilution of 1:1 and without dilution accelerated the development of cotton plants and increased the yield of cotton per plant.--Copyright 1975, Biological Abstracts, Inc.
W76-12257

SOME CAUSES OF ANOMALIES IN OXYGEN MASS TRANSFER IN POLLUTED WATER, (IN RUSSIAN),
Akademiya Nauk Latviiskoi SSR, Riga. Inst. of Wood Chemistry.
O. Y. Vitols, V. P. Paicha, and R. E. Reizin'sh.
Latv Psr Zinat Akad Vestis. 9, p 24-30, 1973.

Descriptors: *Oxygen, *Mass transfer, *Aeration, Oxygen demand, Bacteria, Model studies, Activated sludge, *Sludge treatment, *Waste water treatment.
Identifiers: *Aerators.

Coefficient alpha of polluted water (model) in 2 different aerated laboratory vessels was investigated. In the presence of SAS (surface active substances) it depended on the type of aerator. In the presence of biological systems, the O2 consumption depended on the physiological condition of the bacteria, which are very sensitive to changes in the O2 concentration. Large changes in the physiological condition occur even after short-term (10-20 min) subjection to the complete absence of O2. The efficiency of the aerator in the presence of bacterial sludge was detectable only under natural conditions and allowed only minor deviations from industrial ones.--Copyright 1975, Biological Abstracts, Inc.
W76-12265

EXPERIENCE IN DECONTAMINATION OF INDUSTRIAL WASTES AND TREATMENT PLANT SEDIMENTS IN LENINGRAD, (IN RUSSIAN),
S. A. Goiman, and A. Y. Dudarev.
Gig Sanit. 10, p 94-96, 1974.

Descriptors: *Industrial wastes, *Operation, Treatment facilities, Waste water treatment, *Water pollution treatment, Sediments.
Identifiers: *Leningrad(USSR).

The operation is described of an 50-hectare plot allotted for decontamination of industrial wastes formed during production and of sediments extracted from industrial wastewater treatment plants.--Copyright 1975, Biological Abstracts, Inc.
W76-12291

DEVICE FOR AERATING WATER BODIES, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Inst. of Hydromechanics.
For primary bibliographic entry see Field 5G.
W76-12311

WOOL PROCESS WATER PURIFICATION PLANT.
South African Patent ZA 7305-609. Issued June 11, 1974. Derwent French Patents Abstracts, Vol. V, No. 35, p F2-F3, July, 1974.

Descriptors: *Patents, Oil wastes, *Textiles, *Industrial wastes, *Waste water treatment, Water reuse, Separation techniques, Evaporation, Recycling.
Identifiers: *Wool process waste water.

The design for a wool process water purification plant has been patented. The oily or dirty water from baths for washing and rinsing wools is subjected to a first mechanical purification. During this purification, crude earth and mud are extracted and gathered together to form a throw-out and water is recovered to be reused. The throw-out then goes through a second mechanical purification during which heavy earth and oils are separated and recovered and light mud particles are separated and recycled with the throw-out. The effluent from the second purification is separated and recovered by evaporation. The condensation water is reused; the residual oils and earth are extracted and recovered from the residue of the evaporation stage by mechanical separation. The residual water is also extracted by mechanical separation and then recycled for evaporation with the effluent from the second purification. (Orr-FIRL)
W76-12338

SIEVE UNIT FOR AQUEOUS SLUDGE AND FIBROUS (SUSPENSIONS).
German Patent DS 2028-336. Issued May 16, 1974. Derwent German Patents Abstracts, Vol. V, No. 21, p F3, June, 1974.

Descriptors: *Sludge treatment, *Textiles, *Pulp wastes, *Pulp wastes, *Fibers(Plant), *Sieves, *Patents, Liquid wastes, Filtration, :Waste water treatment, Industrial wastes.

A sieve unit for treating aqueous sludge and fibrous suspensions has been patented. It consists of a cylindrical, horizontal, stationary drum, with a coaxial perforated cylinder that can rotate inside the drum. A material infeed and a diluent liquid infeed enter the chamber from the same side. An inlet chamber is located between the liquid-infeed and the cylinder and is rigidly connected to the cylinder. The cylinder has an opening on the opposite end face, toward the coarse discharge connection. Applications of this apparatus include the filtering of effluents from textile and fiber mills. (Orr-FIRL)
W76-12339

SEPARATION OF WATER-SOLUBLE HEAVY METAL IONS FROM ACID STREAMS.
Netherlands Patent NL 7400-526. Issued July 17, 1974. Derwent Netherlands Patents Report, Vol. V, No. 31, p D3, September, 1974.

Descriptors: *Patents, *Metals, *Separation techniques, Ion exchange, Resins, Chemical precipitation, Mines, Waste water treatment, Chelation, Acid mine wastes.
Identifiers: Electroplating wastes, Cation exchange resins.

A procedure for the separation of water soluble heavy metal ions from acid streams has been patented. Aqueous solutions containing water soluble metal ions are passed through a cation exchange resin containing alkali ions. The heavy metal ions are deposited on the resin, producing a neutral effluent. The cation exchange resin is regenerated with a solution of an alkali metal chelate such as sodium acetylacetonate in alcoholic solution. The metal is then precipitated from the solution with an alkali metal hydroxide; the alkali earth metal chelate is recovered and recycled. This method can be applied to waters used in draining mines and in electroplating metal cleaning. (Orr-FIRL)
W76-12340

DECONTAMINATION OF WATER CONTAINING LIPOPHILIC SUBSTANCES.
Belgian Patent BE 805-716. Issued April 5, 1974. Derwent Belgian Patents Report, Vol. V, No. 17, p D1, May 31, 1974.

Descriptors: *Waste water treatment, *Industrial wastes, *Chemical wastes, Water pollution control, Flocculation, Polymers, Surface waters, Groundwater, Rivers, Potable water, *Patents.
Identifiers: *Lipophilic substances.

A patent was granted for a process for decontamination of water containing lipophilic substances such as mineral oils and pesticides. This involves flocculation treatment with ethylene polymers or copolymers which have less than 50 weight percent of other ethylenic monomers. The polymer used must also contain less than 2 mole percent, based on the monomers used, of a monomer having a carboxyl function, particularly carboxyl acids, esters or amides. The process is followed by a separation of polymer-containing contaminants. This process eliminates pollutants from surface water, groundwater, and river water, and results in water of potable quality. (Murphy-FIRL)
W76-12341

WOOL PROCESS WATER PURIFICATION PLANT.
French Patent FR 2196-971. Issued April 26, 1974. French Patents Abstracts, Vol. 5, No. 21, p D3-D4, June 28, 1974.

Descriptors: *Waste water treatment, *Industrial wastes, *Textiles, *Patents, Water reuse.
Identifiers: *Wool scouring liquor, Fuller's earth, Grease.

A patent was issued for a wool process water purification plant. Separation of fullers' earth sludge and fatty substances on a continuous recycling basis is achieved. Greasy wool passes through a series of washing tanks followed by rinsing baths. The washing water from the tanks is sent through a first mechanical purification phase in which raw earths, slurries, grease and water are separated. The water is fed back to the wash tanks, and the solids, without the grease, are remixed and fed to a second mechanical purification stage. Heavy earths and lighter sludge are extracted, followed by grease extraction and then by evaporation of the water condensate which was used in the rinsing baths. The remaining residue is further segregated and the water recycled. (Kramer-FIRL)
W76-12342

EVALUATING A LOW-ENERGY, HIGH-VOLUME PUMP FOR ODOR REDUCTION FROM LIVESTOCK WASTE LAGOONS BY MIXING,
Oklahoma State University, Stillwater. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5G.
W76-12344

THE RENOVATION AND REUSE OF WATER FOR DILUTION AND HYDRAULIC TRANSPORT OF DAIRY CATTLE MANURE,
Massachusetts Univ., Amherst. Dept. of Agricultural Engineering.
R. E. Graves.
Available from University Microfilms, Ann Arbur, Michigan 48106. PhD Thesis, June, 1971, 120 p. 31 fig, 18 tab, 61 ref.

Descriptors: *Water reuse, *Waste dilution, Recycling, *Farm wastes, *Cattle, *Dairy industry, *Hydraulic transportation, Water pollution, Chemical oxygen demand, Biochemical oxygen demand, Ammonia, Nitrates, Waste treatment, Liquid wastes, Phosphate, Chlorides, Slurries, Aerobic treatment.
Identifiers: *Screening.

An evaluation was made of the concept of pretreatment by screening combined with aerobic stabilization and reuse of water as they might apply to the hydraulic handling of dairy cattle manure. Performance of a stationary sloping screen for separating solid material from dairy manure slurries was evaluated using different bar spacings and different slurry mixtures. Two different systems were used to treat screen effluent. One system consisted of primary settling, aeration and final settling; the other of aeration and final settling. No adverse effects on the treatment systems were noted from the reuse of water. Screening of water-manure slurries removes a significant amount of material from the liquid and makes subsequent treatment and handling easier. Screen effluent may then be irrigated, stored aerobically, or treated to allow reuse for hydraulic cleaning. The addition of screening will improve the operation of many systems now used for treatment of animal manure slurries. (Russell-East Central)
W76-12345

LOW-COST DISPOSAL SYSTEMS FOR FEEDLOT RUNOFF,
Agricultural Research Service, Lincoln, Nebr.
For primary bibliographic entry see Field 5G.
W76-12346

SECOND NATIONAL SYMPOSIUM ON POULTRY INDUSTRY WASTE MANAGEMENT.
Held at University of Nebraska, Lincoln, May 19-20, 1964, 262 p. $5.00.

Descriptors: *Poultry, *Farm wastes, *W
disposal, Lagoons, Odor, Legal aspects, Eq
ment, Waste treatment, Waste water treatm
Waste water disposal.
Identifiers: *Waste management.

Waste management is an issue that the poultr
dustry must be prepared to deal with. This Sec
National Symposium did a great deal to inform
poultry industry of current waste managemen
ternatives. As expected, lagoons were discu
extensively throughout the symposium. M
problems such as poultry waste disposal on
farm, in the hatchery, and in the processing pl
were discussed. Hydraulic manipulation of wa
was described along with considerations of pr
odor control. Legal, social, and economic asp
of waste management were also dealt with. M
more study and research is needed so that
poultry industry can better deal with the prob
and changes of the future. (Russell-East Centr
W76-12347

**SURMOUNTING THE POULTRY WA
PROBLEM,**
Cornell Univ., Ithaca, N. Y. Dept. of Po
Science.
C. E. Ostrander.
In: Proceedings and Abstracts, XV Wo
Poultry Congress and Exposition, New Orl
Louisiana, August 11-16, 1974, p 219-221. 6 re

Descriptors: *Poultry, *Excreta, Anae
digestion, Dehydration, Odor, Methane, F
izers, *Farm wastes, Waste treatment, W
disposal.
Identifiers: *Waste management, Deep pit h
High rise house, Oxidation ditch, Aerated p
Soil injection.

Choice of a poultry waste management syst
dependent upon location, climate, size of o
tion, amount of land, cropping possibilities
Among poultry waste management choices a
following: (1) deep pit, (2) high rise, (3) anae
systems, (4) aerobic systems such as oxid
ditches and surface aeration, (5) soil injectio
dehydration and (7) methane production. O
two dry systems (deep pit and high rise), the
rise house maintains dry manure conditions
easily. For both systems, groundwater see
excess water, and air circulation may be prob
Of the liquid systems, an aerobic system w
only be recommended for an isolated area d
its odor. Conversely, an aerobic system wou
better for a populated area. Where odors
problem at spreading time, soil injection m
used to eliminate the problem. Actual recycl
farm wastes through dehydration and refeed
through methane production is still largely e
mental. The use of dehydrated manure as a
izer is also being eyed with interest. (Merry
East Central)
W76-12348

**PHOTOSYNTHETIC RECLAMATION
AGRICULTURAL SOLID AND LI
WASTES,**
California Univ., Berkeley. Sanitary Engin
Research Lab.
W. J. Oswald.
Summaries of Solid Waste Research and Tr
Grants, EPA Publication No. SW-5r, p 85-86.

Descriptors: *Solid wastes, *Liquid w
Agriculture, Poultry, *Anaerobic digestion, A
Effluent, Aeration, Costs, *Farm wastes, *
treatment, Fermentation, Photosynthesis.
Identifiers: *Photosynthetic reclamation.

In a pilot plant at Richmond, Californi
wastes from a hen house were fermented
anaerobic digestion tank with the effluent fe
directly into an algae pond. Water from the
was used for flushing in the hen house, a
algae were fed to the hens. The pond was a

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iuring the winter. Algae production was 30 to 40 ons (dry wt) per acre of pond. The net waste-han-lling cost would be one cent or less per dozen ggs. (East Central)
W76-12349

MAINE GUIDELINES FOR MANURE AND MANURE SLUDGE DISPOSAL ON LAND.
laine Univ., Orono. Cooperative Extension Ser-ice.
or primary bibliographic entry see Field 5G.
W76-12353

ELATING AGRICULTURAL INSTRUCTION O ENVIRONMENT IMPROVEMENT: THE OLE OF LAND AND SOIL,
rizona Univ., Tucson. Dept. of Agricultural hemistry and Soils.
or primary bibliographic entry see Field 5G.
76-12354

UALITY OF POTATOES GROWN ON FIELDS RRIGATED WITH WASTEWATERS OF COAL-AR CHEMICAL AND METALLURGICAL LANTS, (IN RUSSIAN),
iev Inst. of Nutritional Hygiene (USSR).
r primary bibliographic entry see Field 5C.
76-12355

SER INTAKE DESIGNS FOR FEEDLOT OLIDS COLLECTION BASINS,
ricultural Research Service, Lincoln, Nebr.
L. Linderman, N. P. Swanson, and L. N. elke.
th Annual Meeting, American Society of ricultural Engineers, Oklahoma State Universi- Stillwater, June 23-26, 1974, Paper No. 74-30, 7 p. 3 fig, 5 ref.

scriptors: *Feed lots, *Solid wastes, Agricul-al runoff, *Farm wastes, *Waste treatment, sign.
ntifiers: *Collection basins, *Riser intake igns.

ven the size and shape of a feedlot debris basin, iser intake and conduit can be designed to ove the runoff from the design storm within a ired time. Either corrugated metal pipe (CMP) plastic pipe with 5/8-inch drilled holes is very sfactory for riser intakes. Comparisons of erial requirements, installation labor, and rating experiences indicate that either type of ke is equally satisfactory with the choice de-dent on operator preference. Zinc-plated CMP ot excessively deteriorated by contact with ru- and animal wastes. If the basins are cleaned re solids accumulation seriously interferes drainage, the intakes will operate with little ntenance. (East Central)
-12356

ONOMIC EVALUATION OF LIQUID NURE DISPOSAL SYSTEMS FOR DAIRY TLE,
omic Research Service, Madison, Wis. Farm duction Economics Div.
primary bibliographic entry see Field 5G.
-12357

HAVE TO 'THINK MAINTENANCE' IN AGING FEEDLOT RUNOFF SYSTEMS,
aska Farmer, 2 p., February 3, 1973. 3 fig.

riptors: *Feed lots, *Agricultural runoff, ration and maintenance, Costs, *Farm s, Management, Water pollution control, e treatment.
ifiers: *Debris basin, *Holding ponds, Waste gement.

Feedlots need proper maintenance. The best designed runoff control system can fail if it cannot be maintained properly. To keep cleaning chores easy one feedlot operator has installed gates at the end of debris basins and lot fences on top of debris dikes. These are used so that scraper equipment can remove manure solids which would have been left on the fence row and prevent the manure from being pushed under fence lines by livestock traffic. The final phase of the runoff system is a holding pond which holds storm runoff and pumps the wastes onto field crops. Problems of the system have been clogged riser slots caused by manure solids and hair and problems in pumping the wastes out of the holding pond onto field crops. (Marquard-East Central)
W76-12360

WLJ PREVIEWS FIRST COMMERCIAL MANURE SYSTEM,
G. Richardson.
Western Livestock Journal, Vol. 51, No. 1, p. 1, 7, November 6, 1972. 2 fig.

Descriptors: *Aerobic treatment, Dairy industry, Feed lots, Foam separation, Recycling, Lagoons, Degradation(Decomposition), Waste water treatment, Waste treatment, Odor, *Farm wastes.
Identifiers: Licom waste treatment system, *Odor control, Centrirator, Pasteurization.

DeLaval Separator Company has introduced the Licom Waste Treatment System, which can turn farm wastes into clear water and odor-free, pathogen-free mulch. Licom Systems I and II may be used for smaller operations while Licom III is used for those feedlots which must meet rigid ecological requirements. Licom I uses a liquid manure collecting pit which fills a reactor once weekly with wastes. In the reactor, aerobic bacterial action raises the temperature into the thermophilic range and in 5 to 7 days complete stabilization, decomposition, and pasteurization have occurred. Licom II uses the same procedure only with more reactors for more complete decomposition. Licom III is like Licom II with the addition of a flotation tank that separates fibrous matter from the liquid. For feedlots already using lagoons, a DeLaval Centrirator may be installed which will eliminate odors. (Marquard-East Central)
W76-12361

SOIL CONSERVATION SERVICE, TEXAS TECH UNIVERSITY WORKSHOP COMMITTEE ON FEEDLOT WASTE.
Soil Conservation Service, Temple, Tex.
For primary bibliographic entry see Field 5G.
W76-12363

FACTORS AFFECTING QUALITY AND QUANTITY OF FEEDLOT WASTE COLLECTIONS,
Texas Tech Univ., Lubbock. Water Resources Center.
D. M. Wells.
In: Soil Conservation Service, Texas Tech University Workshop Committee on Feedlot Waste, Texas Tech University, Lubbock, July 28-29, 1971, 3 p.

Descriptors: *Liquid wastes, *Solid wastes, *Slurries, *Gases, *Feed lots, Slopes, Feeds, *Farm wastes, *Cattle, Cleaning, Waste treatment.
Identifiers: *Feedlot waste collection.

Feedlot wastes occur in the liquid, solid, slurry and airborne forms. Factors that affect the pollution potential of these wastes are (1) size of cattle, (2) density of cattle, (3) slope of feedlot, (4) type of surfacing material, (5) type of ration fed, (6) climatic factors, (7) frequency of cleaning. The general way each of these affected feedlot wastes is given. (See also W76-12363) (Kehl-East Central)
W76-12364

MANAGEMENT OF RUNOFF WATER IN RELATION TO FEEDLOT OPERATIONS,
Soil Conservation Service, Temple, Tex.
H. N. McGill.
In: Soil Conservation Service, Texas Tech University Workshop Committee on Feedlot Waste, Texas Tech University, Lubbock, July 28-29, 1971, 13 p. 6 fig, 2 tab.

Descriptors: *Feed lots, *Agricultural runoff, *Irrigation, *Storage capacity, *Farm wastes, Ponds, Management, Waste treatment, Texas, Waste disposal.
Identifiers: Holding ponds.

A system of runoff retention and irrigation is generally considered to be the most practical and economical form of runoff control in Texas. Because of this, information was gathered to determine necessary size ratios of irrigated areas to feedlot areas for adequate runoff control. The study revealed that the required storage capacity varies with the ratio of irrigated area to feedlot area and the location in the state. The eastern part of the state would need a large amount of storage capacity. Considerable flexibility of operation is permitted in the western part of the state by holding ponds with the capacity to impound 25-year, 24 hour runoff from feedlots. Although feedlot runoff is not a dependable irrigation water supply, it can be used to supplement other sources. (See also W76-12363) (Kehl-East Central)
W76-12365

SOIL CONSERVATION SERVICE STANDARD AND SPECIFICATIONS FOR POLLUTION ABATEMENT MEASURES FOR CONFINED LIVESTOCK OR POULTRY FEEDING OPERATIONS,
Soil Conservation Service, Temple, Tex.
For primary bibliographic entry see Field 5G.
W76-12367

GUIDELINES FOR HANDLING LIQUID WASTE FROM FEEDLOTS,
Texas Water Quality Board, Austin.
For primary bibliographic entry see Field 5G.
W76-12368

HYGIENIC EVALUATION OF POTATOES GROWN IN SOIL IRRIGATED WITH EFFLUENTS FROM COKING AND CHEMICAL PLANTS OF THE DONETS COAL BASIN, (IN RUSSIAN),
Kiev Inst. of Nutritional Hygiene (USSR).
For primary bibliographic entry see Field 5C.
W76-12369

EVALUATION OF SOLID WASTE BALING AND BALEFILLS. VOLUME I,
Ralph Stone and Co., Inc., Los Angeles, Calif.
For primary bibliographic entry see Field 5A.
W76-12381

DISSOLVED OXYGEN PROBE,
Fischer and Porter Co., Warminster, Pa. (Assignee).
R. L. Poole.
U.S. Patent No. 3,948,746, 4 p, 3 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 945, No 1, p 315, April 6, 1976.

Descriptors: *Patents, *Waste water treatment, Industrial wastes, *Water pollution treatment, *Aerobic conditions, Dissolved oxygen, *Monitoring, Instrumentation, Electrodes, Dissolved oxygen analyzers.
Identifiers: *Dissolved oxygen probes.

In aerobic treatment processes intended to purify sewage and industrial wastes, the dissolved oxygen is continuously measured in order to monitor and maintain the proper aerobic conditions. A

probe is described which incorporates a galvanic cell whose output current is proportional to dissolved oxygen. The highly sensitive probe also includes a temperature sensor to correct the readings for changes in the temperature of the liquid being tested. The probe has a hollow cylindrical casing of insulating material divided into a lower electrolyte chamber and an upper terminal chamber. Mounted on the stem coaxially within the electrolyte chamber is a tubular-shaped copper counter-electrode which is extended into the terminal chamber for electrical connection. The lower end of the electrolyte chamber is closed by a diffusion membrane which covers a measuring electrode and separates the cell from external liquid. The membrane is permeable to dissolved oxygen in the liquid in which the probe is immersed. Mounted on the end of the stem in the electrolyte chamber is a measuring electrode of gold or platinum, this electrode being connected to a terminal contact in the terminal chamber. The electrolyte chamber is filled with a solution of potassium hydroxide, so that when dissolved oxygen diffuses through the membrane, it is electrochemically reduced at the surface of the measuring electrode to generate a current proportional to the oxygen concentration. The copper counterelectrode is oxidized to complete the cell reaction. (Sinha-OEIS)
W76-12391

HYGIENIC EVALUATION OF ELECTRODIALYSIS WATER DESALINATION SET UP, (IN RUSSIAN),
Moskovskii Gosudarstvennyi Meditsinskii Institut (I) (USSR). Dept. of General Hygiene; and Moskovskii Gosudarstvennyi Meditsinskii Institut (I) (USSR). Dept. of Public Hygiene.
G. I. Sidorenko, Y. A. Rakhmanin, G. I. Rozhnov, E. L. Lovtsevich, and N. A. Nazarova.
Gig Sanit. 10, p 10-16, 1974.

Descriptors: *Electrodialysis, *Desalination processes, Public health, Desalination plants, Operations and maintenance, *Disinfection, Microbial degradation, *Water treatment, *Waste water treatment.

The quality of the desalinated water and the hygienic effectiveness of the electrodialysis desalination method depend on the type and the construction of the installations, the regimen and the time of their running, the level of mineralization and the composition of the original water, the effectiveness of the methods of preliminary and final treatment, conditioning and microbial disinfection of water.--Copyright 1975, Biological Abstracts, Inc.
W76-12394

METHODS FOR REMOVING FLUOBORATES FROM AQUEOUS MEDIA,
Galson Technical Services, Inc., Syracuse, N.Y (Assignee).
J. Singh.
U.S. Patent No. 3,959,132, 5 p, 2 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 946, No 4, p 1739, May 25, 1976.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, *Water pollution treatment, Water pollution sources, Chemical reactions, Separation techniques, Hydrolysis, Aluminum, Lime.
Identifiers: *Fluoborates, Lead and tin plating industry.

Lead and tin fluoborates and fluoboric acid are widely used in lead and tin plating processes and appear as contaminants in the water used to rinse the plated parts. It has been discovered that fluoborates can be rapidly and efficiently removed from aqueous media by first hydrolyzing the fluoborates to fluorides with aluminum or an aluminum salt and then reacting the resulting fluorides with a calcium salt. This converts the fluorides to calcium fluoride, which is sparingly soluble and accordingly precipitates and can be readily separated from the aqueous liquid. The form in which the aluminum is added can be varied. Filings or other finely divided aluminum metal particles or a salt such as aluminum chloride or sulfate can be used. The conversion of the fluorides to calcium fluoride will typically be completed in a period of 5-30 minutes depending upon the form in which the lime is added. The reactions will proceed much more rapidly if a slurry is employed rather than a dry powder. Other compounds capable of contributing calcium ions to the precipitation reactions can be employed. However, lime is preferred because it also produces the desired elevation of pH. Furthermore, lime is an inexpensive source of calcium ion. The aluminum can be readily reclaimed and recycled. (Sinha-OEIS)
W76-12398

APPARATUS FOR BIOLOGICAL AND CHEMICAL PURIFICATION OF WATER BY AGGLOMERATION,
Agrotechnika, narodny podnik, Zvolen (Czechoslovakia). (Assignee).
For primary bibliographic entry see Field 5F.
W76-12401

REVERSE OSMOSIS SYSTEM WITH AUTOMATIC FLUSHING,
Desalination Systems, Inc., Escondido, Calif. (Assignee).
D. T. Bray.
U. S. Patent No. 3,959,146, 4 p, 5 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 946, No 4, p 1744, May 25, 1976.

Descriptors: *Patents, *Water purification, *Demineralization, Water quality control, *Reverse osmosis, Membranes, Membrane processes, Semipermeable membranes, Cleaning, Equipment, Waste water treatment.
Identifiers: *Flushing(Automatic).

A reverse osmosis system for purifying water comprises a module containing a semipermeable membrane. Feed water is introduced under elevated pressure, and a flow control device releases concentrate from the module while maintaining operating pressure. A storage tank is provided with a spigot for dispensing purified water. A by-pass pipe is arranged around the flow control device. A valve, normally closed, is placed in the by-pass pipe and means are provided to automatically open this valve concomitantly with delivery of purified water from the storage tank. The feed water introduced into the module is allowed to flow freely through the module and the by-pass pipe around the flow control device to flush and clean the membrane surface each time purified water is delivered from the tank dispensing means. The valve in the by-pass pipe is connected electrically or mechanically to the storage tank or spigot so that it opens and closes concomitantly. (Sinha - OEIS)
W76-12402

METHOD FOR TREATING PULP-CONTAINING WASTE LIQUORS,
Nippon Carbide Kogyo Kabushiki Kaisha, Tokyo (Japan). (Assignee).
M. Nakajima, and K. Kuwabara.
U.S. Patent No. 3,960,648, 4 p, 1 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 947, No 1, p 287, June 1, 1976.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, Pulp and paper industry, *Water pollution treatment, *Water purification, Water quality control, Flocculation, Resins, Separation techniques, *Pulp wastes.

A method is described for treating pulp-containing waste liquors by adding a flocculating agent and separating and removing the resulting flocculated matter. In treating a pulp-containing waste liq the dicyandiamide formaldehyde resin is added to the waste liquor and mixed wi uniformly, and then, aluminum sulfate is ad Removal of the flocculated matter obtained ca effected by separating the sedimented an floating matter by filtration or other optional s liquid separating operations. The degree of cl of the waste water so treated shows a marke crease over the method comprised of adding minum sulfate first. (Sinha-OEIS)
W76-12404

METHOD FOR SLUDGE TREATMENT,
System AB Infoteknik, Vasteras (Swe (Assignee).
G. H. E. Bjermo, and P. E. Tresjo
U.S. Patent No. 3,960,725, 3 p, 4 fig, 10 ref; cial Gazette of the United States Patent O Vol 947, No 1, p 307-308, June 1, 1976.

Descriptors: *Patents, *Waste water treatm *Industrial wastes, *Chemical wastes, H metals, Water pollution treatment, Separ techniques, Waste disposal, *Sludge treatm Dewatering, Water reuse, Haz *Alkalis(Bases).
Identifiers: *Heavy metal hydroxides.

The invention relates to an automatic and co ous method of converting heavy metal hydro which are obtained in sludge from purifi works for pickling, rinsing and surface-trea plants, into heavy metal oxides in powder a granules. The method is carried out in five s In the first stage, the harmless solid and inse particles are separated. In the second stag sludge is dewatered. The dewatering is cont to such an extent that the sludge obtain retains a thixotropic character. In the third the sludge is treated so that it obtains such a sistency that it can be applied in the form of mm thick film onto a media carrier, which co the sludge through the fourth stage, where takes place in such a way that metal hydrox powder and/or granulated form is obtained granules are collected and concentrated in th stage, and at the same time a subsequent sin of the metal hydroxides takes place to form, normal conditions, harmless metal oxides are difficult to dissolve. The metal oxides a lected in appropriate containers, either for portation or for recovery into metal. The heat used in the fourth and fifth stages can b ized by means of heat exchangers, and the co sate, together with the water obtained second stage, can be discharged to the rec body of water or can be returned as process (Sinha-OEIS)
W76-12410

CHEMICALS AND ALLIED PROD (LITERATURE REVIEWS),
Union Carbide Corp., South Charleston, W. R. F. Nelson, and J. C. Hovious.
Journal Water Pollution Control Federation 48, No. 6, p 1313-1318, June, 1976.40 ref.

Descriptors: *Reviews, *Bibliogra *Chemical industry, *Waste water trea *Chemical wastes, *Biological trea *Byproducts, Physicochemical properties, studies, Kinetics, Activated sludge, Biode tion, Biochemical oxygen demand, Deni tion, Industrial wastes, Adsorption, Sep techniques, Water reuse, Ammonia, Coagul
Identifiers: *Literature reviews.

A review of literature dealing with metho controlling water pollution resulting from ch industry operations is presented. General covered include: biological treatmen biodegradability, physico-chemical treatme waste water byproduct recovery. Specific s discussed under the above general headi clude: the verification of a kinetic model

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design of completely mixed activated sludge systems, the influence of temperature and sludge age on biochemical oxygen demand removal, a prototype treatment plant for handling high concentrations of ammonia, the denitrification of munitions manufacturing waste water, the use of lime for pH neutralization and coagulation of industrial waste water, the technical and economic advantages of in situ regeneration of activated carbon, concepts for water reuse at a coal gasification plant, and cost comparisons of byproduct recovery using carbon adsorption-solvent regeneration and solvent extraction. (Kreager-FIRL)
W76-12412

URIFYING WASTE LIQUOR - FROM E. G. ODIUM CARBONATE PRODUCTION, AM-IONIA REGENERATION, BRINE PURIFICA-ION, ETC.,
elgian Patent BE-837-919. Issued April 16, 1976. erwent Belgian Patents Abstracts, Vol. X, No. 2, p D3, July 7, 1976.

escriptors: *Patents, *Flocculation, *Waste ater treatment, *Chemical industry, Chemical astes, Byproducts, Ammonia, Brines, Car-onates, Sodium compounds, Separation chniques, Industrial wastes, Dewatering, Fertil-ers, Cements.
dentifiers: Solvay process.

patent for a process to purify liquid residual oducts obtained during the production of sodium rbonate by the Solvay process is described hich allows for the recovery of solid products hich in turn can be used for the production of rtilizer or cement. Aqueous solutions obtained uring ammonia regeneration or during brine pu-ication as well as aqueous suspensions obtained uring limestone calcination are purified in the fol-wing steps: mixing the different residual oducts; concentrating the mixture to 8-12 weight solids; adding a flocculating agent; separating e deposited solids during two or more opera-ns, preferably with a centrifuge or disc filter; ding a liquid which is free of chloride ions to the parated solids during the two operations of step and mixing the liquid from the final separating eration of step d with the mixture from step a. e process requires relatively small equipment d only the use of a flocculating agent to give ids products having a low water content. reager-FIRL)
76-12413

-MILLION AGGREGATE PLANT RECY-ES PROCESS WATER,
res Consulting Services Ltd., Vancouver itish Columbia).
obertson, and K. N. Pople.
ter and Pollution Control, Vol. 114, No. 6, p 19-22, 26-28, June, 1976.3 fig.

scriptors: *Recycling, *Water reuse, *Waste er treatment, *Symbiosis, Industrial water, eatment facilities, Equipment, Solid wastes, ter supply, Water conservation, Flocculation.
ntifiers: *Aggregate plants.

ter recycling in an aggregate plant with process er requirements of 6100 gallons/minute is cribed. All waste water flows are collected and ted for solids removal; and clarified water is cled through the plant operation, accounting bout 90% of the plant requirements. Washings n gravel screens are recirculated directly to l screens. Washings from crushed rock sizing ens and drainage water from reclaim tunnels pumped to a waste sand dewatering screw for al solids removal. Overflows from classifier s and from dewatering screws are pumped to a ckener for solids removal. Flocculants are ed to the thickener feed to assist in water fication and to increase the settling rate of d. The clarified thickener overflow flows to a process tank where fresh make-up water is added for plant use. (Kreager-FIRL)
W76-12414

PETROLEUM PROCESSING WASTES, (LITERATURE REVIEWS),
Weston (Roy F.), Inc., West Chester, Pa.
W. L. Hornung, and D. A. Baker.
Journal Water Pollution Control Federation, Vol. 48, No. 6, p 1293-1295, June, 1976.27 ref.

Descriptors: *Reviews, *Bibliographies, *Oil industry, *Waste water treatment, *Water reuse, *Water pollution effects, *Sludge treatment, Model studies, Separation techniques, Kinetics, Oil wastes, Toxicity, Algae, Algal poisoning, Phenols, Sludge disposal, *Industrial wastes.
Identifiers: *Literature reviews.

A review of literature dealing with petroleum processing wastes is presented. Topics covered include: the use of sour water stripper bottom for desalter water, process wash waters, cooling tower make-up, and/or boiler water make-up; the use of an automated pontoon system for oil removal; the advantages of using gravity belt filtration for sludge treatment; comparison studies of thermophilic versus mesophilic anaerobic digestion; the results from tests involving the treatment of API separator effluents with activated carbon; the use of calcium hydroxide and aluminum sulfate for separating oils from petroleum emulsion waste water; chemical treatment processes for making sludge more amenable for landfill; and the use of a continuous flow kinetic model for assessing the effect of increased temperature on phenol toxicity to algae. (Kreager-FIRL)
W76-12415

CONTROLLING SURFACE WATER CONTAMINATION AT THE ESSO REFINERY AT ANTWERP (DE BESTRIJDING VAN DE VERONTREINIGING VAN HET OPPERVLAKTEWATER IN DE ESSO-RAFFINADERIJ TE ANTWERPEN),
L. Bossuyt.
Het Ingenieursblad, Vol 45, No 2, p 41-49, February, 1976. 7 fig, 5 tab.

Descriptors: *Surface waters, *Industrial wastes, *Waste water treatment, *Oil wastes, Coagulation, Separation techniques, Flocculation, Polyelectrolytes, Biochemical oxygen demand, Europe.
Identifiers: *Refinery wastes, Antwerp(Belgium).

The complex waste water treatment system at the Esso Petroleum Refinery at Antwerp, Belgium, is described. Waste water is generated at a rate of 8,500 tons/hour, and about 85% of the total waste water is cooling water. After preliminary oil separation, the waste water has an oil content of 30-50 g/cu m. After neutralization with sodium hydroxide, coagulation and flocculation with iron sulfate or aluminum sulfate and a polyelectrolyte, dissolved air flotation is performed to reduce the oil content to 10-15 g/cu m. Dissolved oil is finally removed by activated sludge treatment, which results in about 90% reduction of the BOD content. The residual oil content is below one g/cu m. (Takacs-FIRL)
W76-12416

THE CLOSED-CYCLE BLEACHED KRAFT PULP MILL,
Toronto Univ. (Ontario).
W. H. Rapson.
Chemical Engineering Progress, Vol 72, No 6, p 68-71, June, 1976. 2 fig, 22 ref.

Descriptors: Pulp and paper industry, *Pulp wastes, *Recycling, *Symbiosis, Industrial wastes, Costs, Water conservation, Effluents, Design criteria, *Treatment facilities, *Waste water treatment.

A closed-loop design for a bleached kraft pulp mill is described that provides for essentially effluent-free operation. The closed-cycle concept involves operating the wood room completely on recycled water. Accumulated suspended solids are settled, filtered or centrifuged out, and either burned or buried. A closed pressurized brown stock screening system uses only recycled filtrate. Screen rejects are filtered and recycled or burned. The amount of water used for washing the pulp in the bleach plant is sharply decreased by countercurrent washing and recycling chlorination filtrate to dilute unbleached pulp entering the first stage. Bleach plant effluent and evaporator condensates are used to wash the unbleached pulp and for other purposes in the chemical recovery system, eliminating the addition of fresh water in the pulping and chemical recovery systems. All chlorine in the bleaching chemicals ends up as sodium chloride which is recovered by a special process. Heat savings are also achieved as a result of decreasing the water requirements of the plant by using countercurrent washing. The capital cost of the closed-loop operation is expected to be only 5% more than conventional plants with no effluent treatment, and the operating cost is only 1% more than that of existing plants without treatment. (Kreager-FIRL)
W76-12417

PAPER MAKING WASTE-WATER PURIFICATION - BY FLOCCULATING, SEPARATING FIBRES FROM FLOCCULATE, ADDING FILTER AID, AND FILTERING SUSPENSION.
French Patent FR 2277-779. Issued March 12, 1976. Derwent French Patents Abstracts, Vol. X, No. 18, p D3, June 9, 1976.

Descriptors: *Patents, *Pulp and paper industry, *Waste water treatment, *Solid wastes, *Flocculation, *Filtration, *Industrial wastes, Byproducts, Centrifugation, Waste treatment, Pulp wastes, Symbiosis, *Pulp wastes.

A patent for a process to remove solids from waste water generated during paper production is described which provides for using pulp wastes as a filter aid. The process consists of the following steps: subjecting the waste water to flocculation, separating the flocculate, dividing the flocculate into a fibrous mass and a fiber-free suspension of waste material in water, adding a filter aid to the suspension which consists of material removed mechanically from the paper pulp prior to paper preparation, and separating the solid waste material from the suspension by filtering or centrifuging. The process also recovers fibers for addition to the pulp. (Kreager-FIRL)
W76-12418

THE EFFECT OF METHODS OF OPERATION OF AERATION BASINS ON THE DEVELOPMENT AND POPULATION DENSITY OF CULEX PIPIENS L. IN THE SOUTH OF THE RUSSIAN SFSR, (IN RUSSIAN),
Rostov Research Inst. of Medical Parasitology (USSR).
For primary bibliographic entry see Field 5G.
W76-12419

COAGULATION OF TEXTILE WASTE WATER,
Vanderbilt Univ., Nashville, Tenn. Dept. of Environmental and Water Resources Engineering.
M. Olthof, and W. W. Eckenfelder.
Textile Chemist and Colorist, Vol 8, No 7, p 18-22, July, 1976. 8 tab, 11 ref.

Descriptors: *Textiles, *Color, *Coagulation, *Waste water treatment, *Sludge treatment, *Chemical oxygen demand, Organic compounds, Lime, Sulfates, Evaluation, Performance, Chemical wastes, Industrial wastes, Efficiencies, Economics.
Identifiers: Alum, Ferric sulfate, Textile finishing.

Coagulation techniques employing ferric sulfate, alum, and lime were evaluated in terms of their potential for removing color from mixed waste water generated by four textile finishing mills. The color content in the waste water was reduced by 80-90% when coagulation with ferric sulfate or alum was employed. Lime yielded a supernatant with a higher residual color content, and the required dosage was 1.5-4 times as high as the dosages for ferric sulfate and alum. Lime sludge was the most easily handled, while alum sludge was the most troublesome. For equivalent color removal, lime was slightly more economical than ferric sulfate and significantly more economical than alum. The most economical system was that in which lime or ferric sulfate was employed, depending on the effluent criteria. Lime resulted in an effluent with higher residual color and a high pH. Coagulation also resulted in the removal of between 30-60% of the organics (expressed as chemical oxygen demand) in waste water at optimum dosages for color removal. (Kreager-FIRL)
W76-12420

ZERO DISCHARGE AS EXEMPLIFIED BY TEXTILE DYEING AND FINISHING,
Clemson Univ., S. C. Coll. of Industrial Management and Textile Science.
J. J. Porter. and C. Brandon.
Chemtech, p 402-407, June, 1976. 9 tab, 5 ref.

Descriptors: *Textiles, *Dyes, *Waste water treatment, *Water reuse, *Filtration, Pilot plants, Reclamation, Evaluation, Performance, Symbiosis, Chemical oxygen demand, Color, Conductivity, Solid wastes, Economics, *Recycling, Treatment facilities.
Identifiers: Zero discharge(Textiles industry).

Hyperfiltration was successfully demonstrated on a pilot plant scale as being capable of renovating composite waste water from a textile dyeing and finishing plant. Both the purified product and concentrated residue from treatment of the composite waste with four commercial membrane modules were reused in production dyeings. The product water was satisfactory for use in all the dyeing operations for water recoveries up to 90%. Detailed performance data which include the average rejection percentage for total solids, color, conductivity, and chemical oxygen demand are tabulated for the following types of hyperfiltration membrane materials: polyamide, cellulose acetate in two different configurations, and zirconium(IV)-polyacrylic acid. Cost estimate comparisons are given for different membrane configurations. (Kreager-FIRL)
W76-12421

COST OF WATER POLLUTION CONTROL IN THE CARPET INDUSTRY,
Exxon Research and Engineering Co., Florham Park, N.J. Water Pollution Control Section.
For primary bibliographic entry see Field 5G.
W76-12422

TANNERY WASTE MANAGEMENT, (LITERATURE REVIEWS),
Cincinnati Univ., Ohio. Dept. of Environmental Engineering.
J. D. Eye.
Journal Water Pollution Control Federation, Vol 48, No 6, p 1280-1282, June, 1976. 15 ref.

Descriptors: *Reviews, *Bibliographies, *Tannery wastes, *Legal aspects, *Waste water treatment, *Reclamation, *Biological treatment, *Sludge treatment, Dewatering, Model studies, Aeration, Suspended solids, Chemical oxygen demand, Color, Sulfides, Lime, Evaluation, Performance, Industrial wastes, Chemical wastes.
Identifiers: Chrome, Tanneries.

A survey of literature dealing with the management of tannery wastes is presented. Topics covered include: legislation affecting tannery discharges; methods for reducing the amount of chrome in tannery effluent; laboratory studies involving the reuse of lime-sulfide unhairing liquors; laboratory procedures for recovering sulfide from unhairing liquors; studies of the biodegradation of chrome tannery wastes in extended aeration units; methods for reducing color, chemical oxygen demand, and total suspended solids in vegetable tanning effluents; the development of mathematical models for biological oxidation and sludge dewatering processes as applied to tannery wastes; and an assessment of the effectiveness of various aeration techniques for the oxidation of tannery wastes. (Kreager-FIRL)
W76-12423

SOME WASTE TREATMENT PROBLEMS IN THE HIDE AND LEATHER INDUSTRIES,
H. W. Young.
Leather Manufacturer, Vol 93, No 6, p 12, 15, 16, 18, 20, 22, 24, 28-31, June, 1976.

Descriptors: *Tannery wastes, *Waste water treatment, *Sludge treatment, *Separation techniques, *Dewatering, *Flocculation, Industrial wastes, Chemical wastes, Solid wastes, Emulsions, Organic compounds, Sulfides, *Industrial wastes.

Water pollution problems associated with chrome and vegetable tanning operations are discussed along with methods for their control. Topics covered include: the use of bar screens, Stehling screens, and other coarse screens to prevent the heavy debris from reaching pumps; problems associated with the plugging of pumps by matted hair and heavy hair burn liquors; the selection of final screening devices; the use of clarification for the separation of grease and solids; the effectiveness of flocculants for breaking grease emulsions; problems associated with the packing tendency of tannery sludges; the success of various methods for dewatering sludge from chrome leather tanneries; methods for the control of final effluent pH; and methods for reducing organic pollutant load and sulfide concentration in vegetable tanning waste streams. (Kreager-FIRL)
W76-12424

RECENT DEVELOPMENTS IN TANNERY EFFLUENT DISPOSAL,
Rhodes Univ., Grahamstown (South Africa). Leather Industries Research Inst.
V. Every, L. S. Dorrington, D. E. Rawlings, D. R. Woods, and D. R. Cooper.
The Journal of the American Leather Chemists Association, Vol 71, No 6, p 276-287, June, 1976. 5 fig, 2 tab, 4 ref.

Descriptors: *Tannery wastes, *Waste water treatment, *Biological treatment, *Activated sludge, Industrial wastes, Chemical wastes, Oxygen demand, Pilot plants, Sulfides, Aeration, Performance, Evaluation, Treatment facilities, Lime.
Identifiers: Tanneries.

Recent developments in the treatment of tannery effluents are reviewed, with particular emphasis on aerobic activated sludge processes. Pilot plant studies indicate that surface aeration of tannery beamhouse liquor acidified to a pH of 9.0 results in an average oxygen demand removal of 76% for a 20-hour retention time without sludge return. Additional experiments indicate that lime usage can be brought down to 2% of hide weight, with the result being that a surface aerator is able to reduce the pH of the beamhouse effluent to approximately 8.0 in a 24-hour retention balancing tank with no addition of acid or manganese catalyst. The reduction of lime usage under these conditions not only eliminates the need for acid addition and flue gas treatment to achieve the proper pH but also results in sulfide removal without the use of a manganese catalyst. Results are also presented for studies on the effect of sludge age and retention time on t purification of fellmongery lime-sulfide effluent a completely mixed activated sludge react (Kreager-FIRL)
W76-12425

ADSORBENT MATERIAL FOR PURIFYING DUSTRIAL EFFLUENTS BY PRECIPITATI BASIC NITROGENOUS POLYMER ON SU PORT USING ACTIVATED MINERAL CLAY
French Patent FR 2284-567. Issued May 14, 19
Derwent French Patent Abstracts, X(26).D2, gust 1976.

Descriptors: *Patents, *Adsorption, *Waste tr ment, *Waste water treatment, *Industrial was Tannery wastes, Pulp wastes, Chemical was Pulp and paper industry, Chemical industry, T tiles.
Identifiers: Activated mineral clay.

A patent has been issued for an adsorbent mat useful in the purification of industrial efflu from the textile, paper, leather, or dye manu turing industries. The material is prepared by precipitation of a basic, nitrogen-contai polymer on a support material by means of ar tivated mineral clay. The adsorbent is used t fect purification by either a mixing operatio use of a fixed bed. This method is cheaper thar rification of similar effluents with traditional culating agents. (Kramer-FIRL)
W76-12426

NEW BEAMHOUSE DEVELOPMENT TO S PLIFY TANNERY WASTE WATER MANA MENT,
Instituut TNO voor Leder en Schoenen, Waal (Netherlands).
P. J. Van Vlimmeren.
The Journal of the American Leather Che Association, Vol. 71, No. 7, p 318-335, July, 6 fig, 8 tab, 13 ref.

Descriptors: *Waste treatment, *Indu wastes, *Chemical wastes, *Waste water t ment, *Tannery wastes, *Organic wastes, plants, Sludge, Byproducts.
Identifiers: Beamhouses.

A summary is presented of new developme the management of tannery waste waters, pa larly organic pollution arising from beamh operations. At TNO in The Netherlan completely new beamhouse system has bee plemented, in which the special treatment residual soak and unhairing liquors from ch leather manufacture led to a dramatic decre the organic pollution load. A sludge bypr with attractive handling properties may also b tained. Both laboratory and pilot plant sca periments have been performed and the pr has been adapted to several Dutch tanneries scale. (Kramer-FIRL)
W76-12427

EFFECT OF WET-AIR OXIDATION ON CHEMICAL COMPOSITION OF SEW SLUDGES,
Purdue Univ., Lafayette, Ind. Dept. of Agro
L. E. Sommers, and E. H. Curtis.
Available from the National Technical Inf tion Service, Springfield, Va 22161, as PB-25 $3.50 in paper copy, $3.00 in microfiche. P University Water Resources Research C Technical Report No. 78. August 1976. 16 p 4 tab, 6 ref. OWRT A-045-IND(1).

Descriptors: *Sewage sludge, *Sewage dis Fertilizers, Sewage treatment, *Waste wate ment, Oxidation, Nitrogen, Denitrification, reuse, Recycling, Chemical properties, Sam Identifiers: *Wet-air oxidation, *Sewage chemical composition, Land application(S sludge).

Sewage sludge samples were obtained from waste streams in two sewage treatments before and after wet-air oxidation. Wet-air oxidation resulted in a 0 - 20% reduction in volatile solids. Concurrently, total N levels in the sludges decreased by >50% while P, Cu, Zn, Ni, Cd and Pb concentrations either increased or remained unchanged. From the standpoint of applying sewage sludge to agricultural land, inclusion of a wet-air oxidation unit in a treatment plant will decrease the desirability of utilizing sewage sludge as a fertilizer material.
W76-12462

TILIZATION OF CLEAR WATER SEWAGE FFLUENT IN MINERAL PROCESSING,
rizona Bureau of Mines, Tucson.
. W. Fisher.
vailable from the National Technical Informaon Service, Springfield, Va 22161 as PB-257 842, .00 in paper copy, $3.00 in microfiche. Compleon Report, August 1976. 35 p, 15 fig, 13 tab, 7 ref. WRT A-046ARIZ(1), 14-34-0001-6003.

escriptors: *Sewage effluents, Waste ater(Pollution), *Activated sludge, *Leaching, Solvent extractions, Froth flotation, *Ion change, *Foam fractionation, Tertiary treatent, Waste water treatment, Copper, Molybnum, Industrial water.
entifiers: *Municipal waste water, *Agitation aching, *Copper ore processing, Copper covery, Molybdenum recovery, Metal recovery.

econdary treated sewage effluent was substituted r normal process water in laboratory tests simuing the unit operations of agitation leaching, solnt extraction and froth flotation applied to pper ores. The combined processes of agitation aching followed by solvent extraction were not versely affected by sewage effluent. However, oth flotation recovery of copper and molybnum sulfides showed significant detrimental sponse to sewage effluent. First, a voluminous, fficulty controlled froth was generated, even in e absence of a frothing agent, that has little neral carrying ability. Second, sewage effluent used a small loss in copper recovery and a large s in molybdenum recovery. The detrimental efts of sewage effluent on flotation were partially ercome by tertiary treatment of the effluent by ivated carbon adsorption and anion exchange. e frothing problem was significantly reduced er treating the sewage effluent by foam fracnation. Dilution of the effluent with normal ocess water resulted in a significant improvent in metal recovery. In addition, the large loss olybdenum recovery was overcome by using a ondary collector in a combination reagent edule. However, the secondary collector sed an appreciable loss in copper recovery.
6-12464

TER POLLUTION CONTROL IN THE ANDINAVIAN COUNTRIES,
ional Water Board of Finland, Helsinki.
Haverinen, and K. Noukka.
uropa, No. 20, p 14-17, 20, 1974. 5 illus, 8 ref.

criptors: *Water pollution control, Europe, reign countries, *Pulp and paper industry, te treatment, *Waste water treatment, *Pulp tes, Sulfite liquors, Water reuse, Legislation, unicipal wastes, Sewage treatment, Water ity control, Water pollution sources, Wastes, dustrial wastes, Sulfite liquors.
ntifiers: *Sweden, *Finland, Scandinavia, ite mills.

extent of water pollution in Finland and den is described, and municipal sewage treatt programs in both countries are reviewed fly. Water pollution control in the Scandinavipulp and paper industries is discussed. In den, small polluting sulfite mills have been aced with modern facilities featuring extensive ution control. All but two of Finland's 33 pulp mills recover their spent pulping liquors. (One of these two mills will be closed shortly, and the other is installing facilities to burn the waste liquor). Emphasis in both countries is on reuse and recovery of waste waters. Some aspects of the environmental protection agreement between Finland and Sweden are Discussed. (Witt-IPC)
W76-12473

MILL EFFLUENT TREATMENT AND FIBER RECOVERY.
Effluent and Water Treatment Journal, Vol. 15, No. 12, p 633, December, 1975. 1 fig.

Descriptors: *Waste water treatment, *Flotation, *Pulp wastes, Wastes, *Industrial wastes, Water pollution treatment, Water pollution sources, Water pollution control, Waste treatment, Screens, Polyelectrolytes, Flocculation, Water purification, Water quality control.
Identifiers: *Fiber recovery, Thames River(England), Kraft mills.

Effluent from Kent Kraft Mills in Northfleet (England) flows through a closed culvert to a sump where coarse tramp material is removed by a manually raked bar screen. The effluent is then dosed with a polyelectrolyte flocculant (not specified) and pumped to an adjacent 30-ft diameter dissolved air flotation unit. The fiber flocs on the surface are removed and returned to the hydrapulper. Clarified effluent is discharged to a second sump and then to the River Thames. Grit from the air flotation unit is discharged into the feed sump for periodic removal by the sludge gulper. The mill produces kraft sack papers from both kraft waste paper and unbleached fresh kraft pulp. (Witt-IPC)
W76-12474

PHENOLIC AND CHLOROPHENOLIC OLIGOMERS IN CHLORINATED PINE KRAFT PULP AND IN BLEACH PLANT EFFLUENTS,
State Univ. of New York at Syracuse. Coll. of Environmental Science and Forestry.
M. Erickson, and C. W. Dence.
Svensk Papperstidning, Vol. 79, No. 10, p 316-322, June 20, 1976. 2 fig, 17 ref, 4 tab.

Descriptors: *Pulp wastes, *Bleaching wastes, *Phenols, Wastes, *Industrial wastes, Water pollution sources, Chlorine, Oxidation, Potassium compounds, Gas chromatography, Mass spectrometry, Lignins, Softwood, Water pollution, Alkalis(Bases), Separation techniques, Organic acids, Organic compounds, Aromatic compounds, *Chlorination, *Waste water treatment, Pollutant identification.
Identifiers: Alkaline extraction, Potassium permanganate, Kraft pulp, Hydrochloric acid, Kappa-number, Kraft mills, Chlorophenols.

Softwood kraft pulp (kappa-number 28.2) was chlorinated with 3.6 and 6.0% applications of chlorine, washed with dilute HC1, and extracted with alkali. The undiluted spent chlorination and alkaline-extraction liquors and the corresponding pulps were oxidized with potassium permanganate to convert the oligomeric phenolic residues contained in them to monomeric aromatic carboxylic acids which were then identified using gas-chromatographic and mass-spectrometric techniques. In the spent chlorination liquors 11 phenolic compounds were detected. Combined yields of their oxidation products indicated a concentration of about 10 ppm for phenolic residues in each of the 2 original liquors (from 3.6 and 6% chlorine). Mono-, di-, and trichloro-substitution was observed on what were originally uncondensed lignin oligomers in the liquors. The presence of 5- and 6-linked condensed phenolic units containing from nil to 2 chloro substituents per phenolic ring was also confirmed. In the spent caustic extraction liquors 13 phenolic compounds were positively or tentatively identified. The estimated total concentration of phenolic substances was about 100 ppm in the liquor from 6%- chlorinated pulp, but much higher (ca. 190 ppm) in the liquor from the 3.6%-chlorinated pulp. The chlorinated pulps contained the same kinds of phenolic compounds as did the spent chlorination liquors, but in higher concentrations. Permaganate oxidation of alkali-extracted pulp indicated that the combination of chlorination plus caustic extraction had removed all but traces of phenolic substances. (Brown-IPC)
W76-12475

POLLUTION CONTROLS -- CONSULTANT'S ROLE,
Mason (H. C.) and Associates, Inc., Gladstone, Oreg.
For primary bibliographic entry see Field 5G.
W76-12478

ULTIMATE DISPOSAL OF BIOLOGICAL SLUDGES -- A NOVEL CONCEPT,
B.C. Research, Vancouver.
For primary bibliographic entry see Field 5E.
W76-12481

VERSATILE FILTRATION UNIT (VIELSEITIG EINSETZBARE FILTRATIONSANLAGE).
Allgemeine Papier-Rundschau, No. 16, p 562, April 20, 1976. 1 fig.

Descriptors: *Filters, *Waste water treatment, *Pulp wastes, Waste treatment, Water pollution treatment, Foreign countries, Equipment, *Filtration, Water purification, Membranes.
Identifiers: Ucarsep filter, *Germany.

The German 'Ucarsep' ultrafiltration unit described (made by Metallgesellschaft AG., Germany) is designed for many purposes, including effluent purification. Advantages claimed include high chemical, thermal, and mechanical resistance of the filtering membranes, continuous operation, high performance, favorable ratio of membrane area to module volume, and compact construction. (Ward-IPC)
W76-12485

REMOVAL AND RECOVERY OF PHENOLS FROM INDUSTRIAL WASTE EFFLUENTS WITH AMBERLITE XAD POLYMERIC ADSORBENTS,
Rohm and Haas Co., Philadelphia, Pa.
E. H. Crook, R. P. McDonnell, and J. T. McNulty.
Industrial and Engineering Chemistry, Product Research and Development, Vol. 14, No. 2, p 113-118, June 1975. 10 fig, 3 ref, 3 tab.

Descriptors: *Phenols, *Waste water treatment, *Ion exchange, Effluents, Water pollution sources, Wastes, Industrial wastes, Separation techniques, Waste treatment, Resins, Organic compounds, Aromatic compounds, Chemical wastes, Chemicals, Water pollution treatment, Water quality control, Water pollution control.
Identifiers: *Amberlite ion exchange resins, Bisphenol A, p-Nitrophenol, Acetone, Methyl alcohol, Ethyl alcohol.

Industrial waste effluents containing 280-6700 ppm of phenol, condensed phenol (bisphenol A), or substituted phenol (p-nitrophenol) were passed through columns containing Amberlite XAD polymeric sorbents in order to remove the phenolic compounds. Using Amberlite XAD-4, a total of 87 g/liter of phenol was removed from a waste effluent containing 6700 ppm of phenol; the resin column allowed less than 1 ppm of phenol leakage. Regeneration of the resin was effected by an acetone or methanol treatment. Acetone (for recycle in the regeneration step) and phenol (99% purity) were recovered by distillation. Bisphenol A (BPA) may be removed from a waste stream (280-910 ppm of BPA) by passage through columns of Amberlite XAD-4 and XAD-7. The capacity of XAD-4 and XAD-7 for BPA was 34 and 16 g/liter,

respectively. The resin was efficiently regenerated (95-100%) with 4% NaOH. p-Nitrophenol (1248 mg/liter) was removed from an industrial waste stream by passage of the effluent through a bed of Amberlite XAD-7. The resin had a capacity of 40 mg/liter at breakpoint of 7.0 mg/liter. The resin was efficiently regenerated with ethanol. (Witt-IPC)
W76-12487

FIRST CLOSED-CYCLE KRAFT MILL,
L. Haas.
Pulp and Paper International, Vol. 18, No. 6, p 35-36, 53, June, 1976. 1 fig, 1 illus.

Descriptors: *Pollution abatement, *Pulp wastes, *Bleaching wastes, Water pollution sources, Wastes, Industrial wastes, Operating costs, Water consumption(Except consumptive use), Pulp and paper industry, Salts, Sodium chloride, *Recycling, Waste treatment, *Waste water treatment, Costs, *Water reuse.
Identifiers: *Kraft mills, Closed-cycle systems, Great Lakes Paper Co.(Canada), Rapson-Reeve salt recovery process, Chemical recovery, Energy conservation.

Great Lakes Paper Company is adding a new 225,000 metric ton/year bleached kraft mill to its existing facilities at Thunder Bay, Ontario. It will feature the first commercial installation of the Rapson-Reeve salt recovery process, in which NaCl is removed from the black liquor cycle. The recovered salt is used in the regeneration of bleaching chemicals. Complete recycling of pulping and bleaching process wastes will eliminate the effluent treatment plant and reduce water and energy consumption and operating cost. A brief description and flow diagram of the salt recovery process are given. (Witt-IPC)
W76-12488

SWISS MILL IS TRYING WET AIR OXIDATION TO GET RID OF SLUDGE AND RECOVER FILLER,
Zimpro Inc., Rothschild, Wis.
B. L. Flynn, Jr.
Paper Trade Journal, Vol. 160, No 9, p 23-24, May 1, 1976. 3 fig.

Descriptors: *Sludge treatment, *Pulp wastes, *Oxidation, Pulp and paper industry, Pigments, Clays, Waste treatment, Water pollution sources, Wastes, Industrial wastes, Carbon dioxide, Inorganic compounds, Water, Europe, Wisconsin, Foreign countries, Treatment facilities, Kaolinites, Titanium, Air, Aeration.
Identifiers: Kaolin, Titanium dioxide, Fillers, Chemical recovery, *Switzerland, *Wet air oxidation.

In 1977, Papierfabrik Biberist (Switzerland), a fine-papers mill, will start up the world's first commercial unit for the recovery of filler clay and pigment from paper mill sludge by wet air oxidation. In the system, built by Zimpro Inc., raw sludge at a concentration between 7 and 8% will be pumped to the oxidation unit at a pressure of 2500 psig. A multistage reciprocating air compressor will supply air at the same pressure, and the sludge and air mixture will be taken into the pressure vessel through heat exchangers. Almost 90% of the organic material in the sludge is oxidized in the reactor to carbon dioxide and water. The rest is solubilized. Oxidized products are drawn off through the process heat exchanger and cooled. The insoluble organic material is removed from the sludge, leaving behind the inorganic materials, primarily kaolin and titanium dioxide. (Sykes-IPC)
W76-12489

MONADNOCK CLEANS UP: SPECIALTY PAPER MILL INSTALLS $1-MILLION WASTE TREATMENT SYSTEM.
Paper Trade Journal, Vol. 160, No. 9, p 28-29, May 1, 1976. 1 fig, 1 tab.

Descriptors: *Pulp wastes, *Waste water treatment, *Treatment facilities, Wastes, Industrial wastes, Water pollution sources, Water pollution treatment, Water purification, Suspended solids, Biochemical demand, Aerated lagoons, Aeration, Settling basins, Tertiary treatment, Water quality control, Water pollution control, Waste treatment, *New Hampshire.
Identifiers: Dorr-Oliver Clariflocculator, Contoocook River(NH).

Waste treatment at Monadnock Paper Mills Inc., Bennington, New Hampshire, which produces about 80 tons/day of graphic arts and technical papers, includes primary chemical-physical clarification, secondary biochemical treatment, and tertiary clarification. Effluent is pumped from the treatment plant's surge chests to the primary treatment system consisting of a Dorr-Oliver Clariflocculator equipped with a center drive sludge rake assembly and skimmer. Almost all of the settleable solids and about 94% of the total suspended solids, as well as approximately 30% of the BOD, are removed in the clarifier. The overflow from the clarifier is gravity-fed either in series or in parallel through two identical 2,500,000 gallon aeration ponds. After secondary treatment the effluent flows by gravity to a tertiary system consisting of two 1,500,000 gallon settling ponds. The effluent is mixed with air to ensure complete saturation with oxygen before being discharged into the Contoocook River Since this facility began operating in July 1974, the mill has surpassed 1978 Environmental Protection Agency requirements. (Sykes-IPC)
W76-12490

CONTAINER CORP. BOXBOARD PLANT INSTALLS CLARIFICATION, SLUDGE RECYCLING SYSTEM.
Paper Trade Journal, Vol. 160, No. 8, p 54, April 15, 1976.

Descriptors: *Activated sludge, *Waste water treatment, *Treatment facilities, *Pulp wastes, Wastes, Industrial wastes, Waste treatment, Water pollution sources, Water pollution treatment, Water pollution control, Florida, Water purification, Sludge treatment, Dewatering, Incineration, Waste disposal, Equipment.
Identifiers: *Board mills, Dorr-Oliver clarifier, Unox process, Dorr-Oliver RSR(Rapid sludge removal) clariflocculator, Emmerson-Jones filter press.

The activated sludge system installed by Container Corporation of America (Fernandian Beach, Florida) is capable of handling over 25,000,000 gal/day of combined process waste streams. The combined plant wastes are initially processed in a 250-ft diameter Dorr-Oliver primary clarifier. Primary clarifier effluent is fed to a Union Carbide 'Unox' oxygen dissolution system, a three-bay structure with a capacity of about 2,500,000 gallons. Mixed liquor goes to two Dorr-Oliver RSR Clariflocculators, each of which features a flocculator influent well. The influent well promotes floculation and increases the settling rate and detention efficiency. The underwater parts of both clarifiers are designed with standard RSR (rapid sludge removal) configuration. Rake arms are equipped with sludge uptake pipes and alternate rate and deflector blades. Waste sludge from the clarifiers is dewatered on two Emmerson-Jones filter presses. Sludge cake is metered to bark burners for disposal. (Sykes-IPC)
W76-12491

PAPER MILL WASTE SLUDGE OXIDATION AND PRODUCT RECOVERY,
Sterling Drug, Inc., New York. (Assignee).
C. A. Hoffman.
United States Patent No. 3,876,497. April 8, 1975, 4 p. 2 fig, 2 claims.

Descriptors: *Pulp wastes, Sludge, *Oxidation, organic compounds, Wastes, Industrial wa Water pollution sources, Clays, Dewate *Sludge treatment, Heat treatment, Pigm Titanium, *Patents.
Identifiers: Paper fillers, Titanium dio *Sludge oxidation.

A process for recovering inorganic paperma fillers (titanium dioxide and clay) from pape waste sludge comprises heating the sludge wi oxygen-containing gas at 160-375C and 500 lb/sq inch, so that most of the water content sludge remains in the liquid phase, for 0.25-5 separating the gas, liquid, and osolid phases washing and dewatering the solids to pr recovered filler suitable for reuse in the pape ing process. (Lynch-IPC)
W76-12493

METHOD FOR TREATING HEMI CAUSTI FLUENTS,
ITT Industries, Inc., New York.
J. D. Wilson, A. Beelik, H. L. Hergert, and R Mitchell.
Canadian Patent No. 976,703. October 28, 19 p. 7 tab, 6 claims.

Descriptors: *Waste water treat *Carbohydrates, *Pulp wastes, *Blea wastes, Degradation(Decomposition), Heat ment, Waste treatment, Water pollution ment, Wastes, Industrial wastes, Effl *Patents, *Cellulose.
Identifiers: *Hemicelluloses, Sodium hydr Alkaline extraction(Bleaching), Ch recovery.

A process is provided for treating the ef from cold caustic extraction of cellulose pul taining 0.5-3.0% hemicellulose and 4-24% N so as to recover the NaOH for reuse. The p consists of heating the effluent to a tempera 175-240C for a period time sufficient to caus mal degradation of hemicelluloses in the e and then employing the effluent still contain degraded hemicelluloses as a source of Na subsequent pulp processing. The degrada the hemicelluloses prevents their deposition cellulosic material during such reuse. (Lynch W76-12495

WASTE TREATMENT SYSTEM,
Kimberly-Clark Corp., Neenah, Wis.
M. G. Mandt.
Canadian Patent No. 968,890. June 3, 1975, fig, 7 claims.

Descriptors: *Waste water treatment, wastes, *Biological treatment, Equi *Biochemical oxygen demand, *Suspended Activated sludge, Waste treatment, Sludg ygen, Water pollution treatment, Circu Aerobic treatment, Aeration, Treatment fa *Patents.

A method of treating a sewage-containing such as paper industry waste waters, to BOD and suspended solids content compr following steps: (1) causing the liquid to m cuitously so that the sewage describes a ge circular and spiral path, (2) introducing an rich gas and activated sludge into the liq passing a portion of the sewage into a centr fying zone, (4) allowing the sludge to settl the clarifying zone so as to leave the liqui the sludge substantially free of suspended (5) removing the clarified liquid from ab sludge, and (6) returning at least a portio settled sludge to the circuitously moving The result is a high-capacity waste tr facility that is extremely compact and yet of reducing both BOD and suspended s 90% or more. (Lynch-IPC)
W76-12496

USGS-WRSIC 76-001 U. S. DEPT. OF I. URBANA-CHAMPAIGN

PROCESS FOR TREATING WASTE WATERS FROM ALKALINE PULPING (PROCEDES DE TRAITEMENT DES EAUX RESIDUELLES DE FABRICATION DES PATES DE CELLULOSE PAR DES METHODES ALCALINES),
A. Vian Ortuno, and J. Rodriguez Jimenez.
French Patent No. 2,169,835. September 14, 1973, 8 p. 10 claims.

Descriptors: *Waste water treatment, *Pulp wastes, *Chemical precipitation, *Coagulation, Organic compounds, Waste treatment, Color, Oxidation, Neutralization, Mixing, Acids, Hydrogen ion concentration, Water pollution sources, Water pollution treatment, Wastes, Industrial wastes, *Patents.
Identifiers: *Black liquors, Kraft mills.

A process for treating dilute black liquors from alkaline pulping involves mixing them with enough strong acid to lower their pH to below 6.5, thus precipitating nearly all of the nonbiodegradable organic material via coagulation. This material is then separated from the liquid. The liquid is then subjected to complementary treatment involving sorptive decoloration, atmospheric oxidation, and neutralization to meet discharge requirements. (Speckhard-IPC)
W76-12497

IMPROVEMENTS TO PROCESSES FOR PURIFYING EFFLUENTS ORIGINATING FROM THE MANUFACTURE AND BLEACHING OF CHEMICAL OR SEMICHEMICAL PAPERMAKING PULPS (PERFECTIONNEMENT AUX PROCEDES D'EPURATION DES EFFLUENTS PROVENANT DE LA FABRICATION ET DU BLANCHIMENT DES PATES A PAPIER DITES CHIMIQUES OU SEMI-CHIMIQUES),
J. Bebin, P. Boulenger, and J.-C. Bourdelot.
French Patent No. 2,159,560. June 22, 1973, 11 p. 2 fig, 2 tab, 5 claims.

Descriptors: *Waste water treatment, *Pulp wastes, *Bleaching wastes, *Chemical precipitation, *Flocculation, Waste treatment, Separation techniques, Hydrogen ion concentration, Water purification, Water pollution treatment, Wastes, Industrial wastes, Aluminum, *Patents.
Identifiers: *Aluminum sulfate.

A process for purifying pulp mill waste waters and bleach plant effluents is claimed, in which part of the nonbiodegradable materials present in the process water are precipitated in a primary stage by adddition of excess aluminum sulfate. The solution obtained after separation of the precipitate is subjected in a second stage to flocculation by the excess aluminum sulfate remaining in solution, with adjustment of pH to about 5.4. The precipitates and flocculant material formed in the two stages are separated and treated to allow the recovery of aluminum sulfate. (Sykes-IPC)
W76-12498

AEROBIC LAGOON WASTE TREATMENT AND METHOD,
Kimberly-Clark Corp., Neenah, Wis. (Assignee).
J. R. Le Compte, Jr., and D. W. Appel.
United States Patent No. 3,893,924. July 8, 1975, 9 p. 5 fig, 6 claims.

Descriptors: *Aerated lagoons, *Waste water treatment, *Pulp wastes, Circulation, Jets, Suspended solids, Electric power demand, Aeration, Waste treatment, Water pollution treatment, Wastes, Industrial wastes, Aerobic treatment, Patents, Oxidation lagoons.

A system for treating liquids containing waste materials, such as paper mill effluents, includes a basin or lagoon which is operated aerobically by the use of jets arranged so as to set up cells of complementary primary circulation with resulting secondary circulation patterns sufficient to prevent solids from settling out, except when desired in a settling zone. Power requirements are reduced as compared to those of conventional surface-aerated or diffuser-aerated lagoons equipped to operate aerobically. (Lynch-IPC)
W76-12499

PROCESS FOR TREATMENT OF PAPER PULP-CONTAINING EFFLUENTS (VERFAHREN ZUR BEHANDLUNG VON PAPIERBREIHALTIGEN ABFALLFLUESSIGKEITEN),
Nippon Carbon Co. Ltd., Tokyo.
M. Nakajima, and K. Kuwabara.
German Patent (Offenlegungsschrift) No. 2,505,744. September 25, 1975, 17 p. 4 tab, 4 claims.

Descriptors: *Pulp wastes, *Waste water treatment, *Flocculation, *Chemical precipitation, Waste treatment, Water pollution sources, Water pollution treatment, *Patents.
Identifiers: *Dicyandiamide-formaldehyde resins, *Aluminum sulfate.

This process for paper mill effluent treatment is based on the use of dicyandiamide-formaldehyde resin as a flocculant in amounts of 1-50 weight parts per 100 weight parts of turbid substances. Addition of the flocculant is followed by addition of aluminum sulfate. (Speckhard-IPC)
W76-12501

PROCESS FOR SEPARATING CELLULOSE FROM WASTE WATER (VERFAHREN ZUR BEFREIUNG VON ZELLULOSE AUS ABWAESSERN),
Mo Och Domsjo A.B., Ornskoldsvik (Sweden).
H. O. Samuelson.
German Patent (Offenlegungsschrift) No. 2,501,719, July 31, 1975, 38 p. 2 fig, 20 claims.

Descriptors: *Bleaching wastes, *Pulp wastes, *Waste water treatment, *Anion exchange, Organic compounds, *Sorption, *Polymers, Sulfates, Chlorides, Ions, Effluents, Organic acids, Chlorination, Aromatic compounds, Alkalis(Bases), Resins, *Cellulose, Waste treatment, Wastes, Industrial wastes, Water pollution treatment, Ion exchange, Oxygen, *Patents.
Identifiers: Alkaline extraction, Oxygen bleaching, Chlorine dioxide.

A process is claimed for separating organic substances from pulp mill effluents through sorption on water-insoluble polymers (preferably cross-linked polymers) and for recovering these substances. The process is characterized in that a portion of the effluent with a low content of inorganic anions, such as sulfate and chloride ions (e.g., the effluent from an alkaline extraction stage or an oxygen bleaching stage), is brought into contact with one or more organic anion exchangers to remove all organic acids or anions and to adsorb organic nonelectrolytes while another portion of the effluent (preferably with a high chloride content, such as the effluent from chlorination or chlorine dioxide bleaching), is brought into contact with an adsorbing resin with a structure such that aromatic compounds are adsorbed while the chloride ions remain in solution. Following the sorption stage, the anion exchanger is regenerated with a solution containing active alkali, the solution being additionally used, wholly or partly and preferably following regeneration, in the desorption of materials adsorbed by the adsorption resin.(Speckhard-IPC).
W76-12502

APPARATUS, INSTALLATION, AND PROCESS FOR DEWATERING CLARIFIED SLUDGES (VORRICHTUNG, ANORDNUNG UND VERFAHREN ZUR ENTWAESSERUNG VON KLAERSCHLAEMMEN),
Voit, Michael, Fa., Weissenstadt, (West Germany).
K. Voit.
German Patent (Offenlegungsschrift) No. 2,320,494. November 7, 1974, 9 p. 4 fig, 7 claims.

Descriptors: *Sludge treatment, *Dewatering, *Filters, *Pulp wastes, Wastes, Industrial wastes, Water pollution sources, Screens, Size, Waste treatment, Solid wastes, Sludge, Operation and maintenance, Filtration, Water pollution treatment, Fibers(Plant), *Patents.
Identifiers: *Vacuum drum filters.

A vacuum drum filter for dewatering sludges with a component of fibrous materials (e.g., paper mill sludge) is characterized by the use of a filter drum with a metal screen of relatively coarse mesh (mesh openings larger than the diameter of the fibers in the sludge but smaller than the length of most of the fibers) tightly stretched around the drum periphery. Use of such a screen in place of a relatively fine textile filter material permits uninterrupted operation with the same filtering element over periods of several years while giving a satisfactory filtering effect. (Speckhard-IPC)
W76-12503

PROCESS FOR PRECLEANING INDUSTRIAL WASTE WATER RESULTING FROM THE PROCESSING OF WATER-SOLUBLE PHENOLIC RESINS OR UREA-FORMALDEHYDE RESIN SOLUTIONS (VERFAHREN ZUR VORREINIGUNG VON BEI DER VERARBEITUNG VON WASSERLOESLICHEN PHENOLISCHEN RESOLEN ODER VON HARNSTOFF-FORMALDEHYDHARZLOESUNGEN ANFALLENDEM INDUSTRIEABWASSER),
V. Polinek.
German Patent (Offenlegungsschrift) No. 2,335,327. July 18, 1974, 11 p. 5 claims.

Descriptors: *Waste water treatment, *Chemical precipitation, *Phenols, Hydrogen ion concentration, Sedimentation, Polyelectrolytes, Wastes, Industrial wastes, Water pollution sources, Water pollution treatment, Binders, *Patents, *Resins.
Identifiers: Plywood, Wood particle board, Urea-formaldehyde resins, Aluminum sulfate, Aluminum chloride, *Phenolic resins.

A process for pretreatment of effluents from particle board or plywood plants to remove phenolic or urea-formaldehyde resins involves (1) precipitation in a neutral or weakly acidic medium using aluminum sulfate and/or aluminum chloride solutions -- acidified (if necessary) through the addition of inorganic acids; (2) accelerating the sedimentation of the resulting precipitate through addition of synthetic polyelectrolytes, and (3) separating off and recycling the sedimented precipitate. (Speckhard-IPC)
W76-12504

PROCESS FOR PURIFYING PAPERMAKING EFFLUENTS (VERFAHREN ZUR REINIGUNG VON BEI DER PAPIERHERSTELLUNG ANFALLENDEM ABWASSER),
Akzo N.V., Wuppertal (West Germany).
L. O. Barkman.
German Patent (Offenlegungsschrift) No. 2,529,861. January 29, 1976, 12 p. 1 fig, 1 tab, 1 claim.

Descriptors: *Waste water treatment, *Pulp wastes, *Flocculation, *Filtration, *Centrifugation, Wastes, Industrial wastes, Waste treatment, Water pollution treatment, Fibers(Plant), Clays, Sands, Chemicals, Plastics, Films, *Patens.
Identifiers: Waste paper treatment.

A process for purifying effluent from paper machines (especially papermaking involving the reuse of waste paper stock) involves addition of a flocculant, removal of fibrous components from the effluent, addition of a filtration aid, and removal of the remaining solids in the effluent via filtration or centrifugation. In particular, the filtra-

tion aid is the material separated from the pulp prior to papermaking (generally a mixture of waste paper impurities including heavy particles such as sand, clay, and other substances serving as fillers as well as bits of plastic film). (Lynch-IPC)
W76-12505

EFFLUENT TREATMENT PROCESS (ABWASSERAUFBEREITUNGSVERFAHREN),
Hitachi Ltd. (Japan).
T. Kobayashi, M. Yuasa, and M. Itoh.
German Patent (Offenlegungsschrift) No. 2,344,587. April 18, 1974, 23 p. 1 fig, 3 tab, 3 claims.

Descriptors: *Waste water treatment, *Wood wastes, *Suspended solids, *Adsorption, Waste treatment, Water pollution sources, Heavy metals, Dyes, Detergents, Sawdust, Farm wastes, Water pollution treatment, Water pollution control, Industrial wastes, *Patents, *Biological treatment, Mixing.

A process for biological treatment of industrial effluents includes mixing the effluent with fully developed tissue cells of seed plants (e.g., sawdust, comminuted wood, or agricultural waste). Substances such as heavy metals, dyes, and detergents are effectively adsorbed by the tissue cells and are separated from the waste water when the tissue cells are removed. (Speckhard-IPC)
W76-12506

PROCESS FOR PURIFYING INDUSTRIAL EFFLUENTS (VERFAHREN ZUR REINIGUNG VON INDUSTRIELLEN ABWAESSERN),
CIBA-GEIGY Ltd., Basel (Switzerland).
H. Wegmuller, and J. Haase.
German Patent (Offenlegungsschrift) No. 2,365,559. July 10, 1975, 35 p. 10 claims.

Descriptors: *Waste water treatment, *Pulp wastes, *Adsorption, *Color, Wastes, Industrial wastes, Textiles, Dyes, Water purification, Water pollution treatment, *Solid contact processes, Sorption, *Cellulose, Waste treatment, *Patents, Polymers.
Identifiers: Leather, Waste paper, Aminoplast resins, Adsorbents, *Decoloring.

A process for purifying (especially decoloring) industrial effluents (e.g., from the textile, paper, leather, or dyeing industries) involves contacting the waste water with a cellulosic adsorbent material (pulp, waste paper) pretreated with a basic polymeric precipitating agent (e.g., a water-soluble basic aminoplast). (Speckhard-IPC)
W76-12507

ON THE MECHANISM OF GAMMA-RADIOLYSIS OF EFFLUENTS (K MEKHANIZMU GAMMA-RADIOLIZA STOCHNYKH VOD),
Belorussian State Univ., Minsk (USSR).
L. V. Dyubchenko, A. M. Kovalevskaya, V. D. Maiboroda,, E. P. Petryaev, and V. G. Shlyk.
Vestsi Akademii Navuk Belaruskai SSR, Seriya Fizika-Energetychnykh Navuk, No. 4, p 38-41, 1974. 1 fig, 10 ref.

Descriptors: *Radiation, *Gamma rays, Effluents, Oxygen, Oxidation, Water pollution sources, Wastes, Industrial wastes, *Waste water treatment, Water pollution treatment, *Radiation, *Irradiation.
Identifiers: *Black liquors, Hydrogen peroxide, *Radiolysis.

Redistilled water saturated with air and kraft black liquor diluted with 500 volumes of water saturated with air were irradiated with gamma-rays (from Cs-137) at a rate of 65 + or - 1 rad/sec. In the course of irradiation (up to 20 min) determinations were made of the concentration of dissolved oxygen and hydrogen peroxide. For pure water, the radiation yield (positive) of hydrogen peroxide was 1.1 and oxygen (negative) 0.5. For black liquor, the corresponding values were zero and 1.3. The relatively low oxygen radiation yield can be explained by a low rate of oxidation in the system, while the absence of hydrogen peroxide is due either to its reaction with radicals in the solution or its consumption for oxidation of dissolved substances. The experimental radiation yield values are in agreement with values calculated on the basis of generally accepted mechanism of water radiolysis. The high oxygen yield value (3.3) reported for water by Compton in Isotopes and Radiation Technology, Vol. 8, p 453 (1971), close to that obtained by him for an effluent (3.5), was apparently due to the presence of impurities acting as acceptors. The range of oxygen yields, from 1.3 (found in diluted black liquor) to 3.5 (reported by Compton), indicates that the oxygen consumption depends on the nature of polluting substances dissolved in water. (Stapinski-IPC)
W76-12508

CONSTRUCTION AND OPERATION OF HIGH-PRESSURE FILTERS WITH MOLECULAR SIEVES (BUDOWA I DZIALANIE WYSOKOCISNIENIOWYCH FILTROW Z SITAMI MOLEKULARNYMI),
Technical Univ., Lodz (Poland). Inst. of Papermaking and Paper Machinery.
T. Tyralski.
Przeglad Papierniczy, Vol. 32, No. 4, p 132-136, April, 1976. 6 fig, 18 ref.

Descriptors: *Reverse osmosis, *Waste water treatment, *Pulp wastes, Membranes, *Construction, *Operation and maintenance, Pulp and paper industry, Sulfite liquors, *Membrane processes, Separation techniques, Water pollution treatment, Water pollution control, Water pollution source, Toxicity, Waste treatment, *Sieves, *Filters.
Identifiers: Closed systems.

The process of reverse osmosis is discussed, including the general principles of this technique, the types of membranes used (homogeneous and heterogeneous) and their preparation, the classification and construction of reverse osmosis equipment, and the applications of the technique in the pulp and paper industry (e.g., removal of solubles from dilute sulfite pulping effluents, and concentration of difficult to oxidize and toxic substances). It is pointed out that reverse osmosis filters may play an important role in achieving closed water cycles at pulp and paper mills. (Stapinski-IPC)
W76-12509

MODERNIZED OPERATION OF (EFFLUENT) PURIFICATION EQUIPMENT (SOVERSHENSTVOVAT' RABOTU OCHISTNYKH SOORUZHENII),
Vsesoyuznyi Nauchno-Issledovatelskii Institut Gidroliznoi Promyshlennosti, Moscow (USSR).
L. I. Bryzgalov.
Gidroliznaya i Lesokhimicheskaya Promyshlennost, No. 2, p 6-7, 1976. 2 tab.

Descriptors: *Treatment facilities, *Waste water treatment, *Operation and maintenance, Filters, Filtration, Sedimentation, *Biological treatment, Aerated lagoons, Biochemical oxygen demand, Suspended solids, Leakage, Overflow, *Yeasts, Water pollution sources, Water pollution control, Waste treatment, Wastes, Industrial wastes, Hydrolysis, Effluents, *Fermentation.
Identifiers: USSR.

The effluents of fermentation plants and yeast-producing factories are first purified mechanically in sand filters and radial sedimentation tanks, then subjected to biological purification in aeration tanks or on biological filters. The 5-day BOD of purified effluents is 0.18-1.26 kg/cu m, their content of suspended solids 0.05-0.26 kg/cu m. In most plants, existing purification equipment needs to be expanded and modernized. This should be done by 1980. In the meantime, however, the purification efficiency can be substantially increased by reducing the degree of pollution of the effluents and by improving equipment operation. Thus, pollution can be reduced by controlling losses through leaks and overflow, and by the introduction of biological oxidation in air-float yeast-growing tanks. The operation of the equipment can be improved by better control of various stages of the process and by adequate maintenance. These methods and measures are described and their effects in terms of reduced pollution and higher effluent purification are estimated. (Stapinski-IPC)
W76-12511

COST FUNCTIONS FOR WASTEWATER CONVEYANCE SYSTEMS,
Louvain Univ. (Belgium). Groupe de Travail d'Economie de l'Environnement.
D. Tyteca.
Journal of the Water Pollution Control Federation, Vol. 48, No. 9, p 2120-2130, September 1976. 5 fig, 1 tab, 20 ref.

Descriptors: *Waste water(Pollution), *Water pollution control, Water quality, Economics, *Optimization, *Costs, Mathematical models, Equations, *Regional analysis, *Waste water treatment, Constraints, Hydraulics, Flow, Pipes, Pressure, Gravity, Planning, Numerical analysis, Regression analysis, Linear programming, Systems analysis, Sewers.
Identifiers: *Cost minimization, Nonlinear programming, *Waste water conveyance.

Waste water transportation cost functions are important in regional minimum-cost water-quality control models. These cost functions are elaborated, in a Belgian study, beginning with a description of the installations to be provided and their cost. Hydraulic relationships are obtained in order to derive more useful forms of the total cost. A preoptimization study is conducted to express the cost as a function of the flow. The flow is the decision variable in the regional models, and the cost equations must be clear of the diameter of the pipe. After numerical examples, the applicability of the analysis to larger contexts is discussed, and the role of the cost function as a component of the regional models is recalled. Results indicate that the cost functions of waste water conveyance and treatment are concave--the greater quantities of waste water transported or treated cost less than smaller ones. (Bell-Cornell)
W76-12513

OPTIMIZING FLOCCULATOR POWER INPU
Environmental Protection Agency, San Juan, Puerto Rico.
R. Andreu-Villegas, and R. D. Letterman.
Journal of the Environmental Engineering Division, Proceedings of the Society of Civil Engineers, Vol 102, No EE2, p 251-263, April 19 10 fig, 2 tab, 9 ref.

Descriptors: *Environmental engineer *Flocculation, *Sewage treatment, Water tr ment, *Mixing, Coagulation, Sedimentat Water quality control, *Waste water treatment

The effect of the intensity and duration of the m ing used during and immediately following coa lant addition (initial mixing), the mixing inten used for flocculation, the alum coagulant d and the length of the flocculation period residual turbidity after sedimentation were stu using a laboratory jar test-type procedure. F given flocculation period, T, there is an optim G value, G*, corresponding to a minimum resi turbidity. The use of G* optimizes the power i to the flocculation basin. The product (G*)2.8 which G is in sec-1 and T is in minutes is equ 490,000, 190,000 and 70,000 for alum doses of 25, and 50 mg/l respectively. The product (G*) is not a function of the initial mix conditions.

minimum residual turbidity decreases as the flocculation period T increases; however, the rate of decrease diminishes after a flocculation period of approximately twenty minutes. (Bell-Cornell)
W76-12525

QUANTITATIVE ASSESSMENT OF ENVIRONMENTAL IMPACT,
Parsons (Ralph M.) Co., Pasadena, Calif. Systems Div.
For primary bibliographic entry see Field 6G.
W76-12528

POLLUTIONAL ANALYSIS OF COMBINED SEWER SYSTEMS,
Norsk Institutt for Vannforskning, Blindern.
O. G. Lindholm.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, Vol 102, No EE2, p 301-312, April 1976. 9 fig, 1 tab, 29 ref.

Descriptors: *Water pollution, *Combined sewers, *Environmental engineering, *Storm water, Basins, Retention, Storage tanks, Mathematical models, Storm surge, Runoff, Biochemical oxygen demand, Simulation analysis, Systems analysis, Networks, *Waste water treatment, Treatment facilities.
Identifiers: Receiving water.

Mathematical models for sewer networks and wastewater treatment plants have been used to simulate the BOD levels at different points in the treatment works and to combine sewer overflows under different conditions. The network and the treatment plant were simulated as a unit during an entire year's varying precipitation. Stormwater retention basins proved to be beneficial in reducing total pollution load discharged to the receiving waters only when the degree of pollution in stormwater runoff exceeded a specific limit. However, the effect of a retention basin increased considerably when the storm overflows and the basin outlet flows were set to an optimum setting, and when the size of the secondary clarifier was compatible with the retention basin. The simulations showed that retention basins could have an adverse effect on the discharge of BOD to the receiving water if the amount of BOD is removed by the storm overflow anyway. (Bell-Cornell)
W76-12530

INFLUENCE OF SPECIAL CONSTRUCTIONS IN REGIONAL WASTE WATER SYSTEMS AND THEIR ROLE IN MATHEMATICAL MODELS FOR PLANNING.
Karlsruhe Univ. (West Germany). Institut fuer Hydromechanik, Staunanlagen und Wasserversorgung.
H. Orth.
In: The Use of Computer Techniques and Automation for Water Resources Systems, Washington, D. C., 1974, Volume II, p 36-42. 3 fig, 8 ref.

Descriptors: *Waste water(Pollution), *Treatment facilities, *Planing, *Regional development, Optimization, Methodology, Mathematical models, Pipes, Constraints, Systems analysis, Economics, *Waste water treatment.
Identifiers: Cost minimization, Storm water outlets, Binary optimization.

Regional waste water systems become viable solutions to the problems of waste water management, where we are forced to remove waste water over larger distances because the receiving water situation at the place of origin poses difficulties with the increasing sewage flow. Closely connected with this problem is the claim for higher efficiency and reliability of the sewage treatment plants. This requires both a complicated technology and highly qualified operators, requirements which can usually be realized only at the larger treatment units. From this there frequently follows an economical profit in the construction and operating of a large system. This article discusses mathematical models as an instrument for planning and deals with the dimensioning of special constructions and their consideration by means of the binary optimization technique. (See also W76-12535) (Bell-Cornell)
W76-12545

THE UNITED STATES ENVIRONMENTAL PROTECTION AGENCY'S STORM WATER MANAGEMENT MODEL,
Environmental Protection Agency, Washington, D.C. Office of Research and Monitoring.
For primary bibliographic entry see Field 5G.
W76-12549

THE SOLUTION OF THE REGIONALIZATION PROBLEM BY CERTAIN BRANCH-AND-BOUND METHODS,
Karlsruhe Univ. (West Germany). Institut fuer Hydromechanik, Staunanlegen und Wasserversorgung.
W. Ahrens.
In: The Use of Computer Techniques and Automation for Water Resources Systems, Washington, D.C., April 1974, Vol. II, p 100-111. 4 fig, 3 tab, 15 ref, 1 appen.

Descriptors: *Waste water treatment, *Planning, *Regional development, *Community development, *Optimization, *Treatment facilities, Economics, Design, Construction costs, Operating costs, Constraints, Computers, Algorithms, Equations, Mathematical models, Systems analysis.
Identifiers: *Waste water collection, *Branch-and-bound methods, *Linear binary optimization, Cost minimization, Sewerage systems, Computation time, Computer storage.

The need for planning the process of regional and intercommunity waste water collection and treatment systems is increasing continually in importance with regard to communities, regional water authorities, and civil engineers. Increasing costs oblige the community and design engineer to apply rational methodology for the technical conception as well as for financing. This work presents a computation scheme which allows a determination of the most economical locations of treatment plants and the interconnecting sewerage system so that the regional costs are minimized. The optimal solution is found considering implicitly all possible technical alternatives to a waste water association. Proceeding from a mathematical model which describes the optimization problem, the transformation into a linear binary optimization problem is shown. This problem is more easily solved with certain algorithms than the original non-linear problem. The binary model allows the designer to consider several parameters and thus system components. (See also W76-12535)
W76-12552

THE DISPOSAL OF WASTES INTO THE SEA OF THE PROVINCE OF ROME (ITALY), (IN ITALIAN),
For primary bibliographic entry see Field 5E.
W76-12570

REPORT OF THE QU'APPELLE BASIN STUDY BOARD.
Saskatchewan Quappelle Basin Study Board, Regina.
For primary bibliographic entry see Field 5G.
W76-12587

WATER QUALITY OBJECTIVES.
Environmental Protection Service, Regina (Saskatchewan). Water Pollution Control Branch.
For primary bibliographic entry see Field 5G.
W76-12588

AVERAGE RISE OF EPA PLANT, SEWER INDEXES SLOWS.
Engineering News Record, Vol. 196, No. 26, p 112, June 24, 1976. 3 tab.

Descriptors: *Waste water treatment, *Activated sludge, *Treatment facilities, *Sewers, *Cost trends, Federal government, Cities, Average costs.
Identifiers: Cost indexes.

Sewer and plant cost indexes compiled by the Federal Environmental protection Agency (EPA) rose from 1% to nearly 3% during the second quarter of 1976. However, the average increase rate for the series of three indexes during this period dropped slightly below the average increase rate for the previous quarter. City indexes for hypothetical facilities were determined for 25 cities. The average for a five-mgd plant increased 1.1% from the first-quarter average; that for a fifty-mgd plant increased 1.8%, and that for complete urban sewer systems increased 2.9%. The increase rates dropped from a first quarter average of 2.7% for a 5-mgd plant and from 2.6% for a 50-mgd plant, but increased from 2% for the sewer system. The 5-mgd hypothetical plant include a bar screen, grit chamber primary clarification, conventional activated sludge, chlorination, gravity thickening and vacuum filtration. The 50-mgd plant include these plus lime clarification and multimedia gravity filtration as well as multiple hearth incineration. Labor considerations in the cost index for the sewer system include common laborers, cement finishers, carpenters, and medium equipment operators. Fringe benefits are included in labor rates. Concrete is ready-mix; pipe is reinforced concrete 24 in. in diameter, lumber is lowest grade, and asphat is assumed to be paving asphalt. Second-quarter averages for old sewage treatment plant and sewer construction cost indexes were 257.8 and 269.7, respectively, up 4.8% and 5.5% respectively, from June 1975. (Snyder-FIRL)
W76-12598

APPARATUS AND PROCESS FOR PRODUCING AN ORGANIC PRODUCT FROM SEWAGE SLUDGE,
Q. L. Hampton.
United States Patent 3,963,471. Issued June 15, 1976. Official Gazette of the United States Patent Office, Vol. 947, No. 3, p 1223-1224, June, 1976. 1 fig.

Descriptors: *Patents, *Sewage sludge, *Organic compounds, *Sludge treatment, *Byproducts, *Waste treatment, Coagulation, Flocculation, Separation techniques, Dewatering, Temperature, *Recycling.

A patent for a process which produces an organic product from sewage sludge is described. The process consists of the following steps: mixing a predetermined quantity of liquid waste sewage sludge with chemicals for coagulating or flocculating the solids contained in the liquid sludge, subjecting the mixture to pressure for the extraction of a portion of the moisture, draining off the extracted moisture, heat drying and pelletizing the detwatered material to produce pellets, subjecting the dry pelletized material to a suction action in order to separate dust and fine particles from the pellets, and discharging the separated pellets by gravity to a storage location. In addition, a portion of the pellets produced are mixed with the dewatered material for drying and preheating prior to the heat drying and pelletizing stages so that the drying temperatures can be selected low enough to prevent formation of clinkers and the ignition of organic material. (Kreager-FIRL)
W76-12600

PROCESS FOR TREATING DECOMPOSABLE ORGANIC WASTE MATERIALS,
L. A. Haug.

United States Patent 3,963,470. Issued June 15, 1976. Official Gazette of the United States Patent Office Vol. 947, No. 3, p 1223, June, 1976.

Descriptors: *Patents, *Sewage sludge, *Organic compounds, *Sludge treatment, *Byproducts, Aeration, Biological treatment, Absorption, *Decomposing organic matter, *Waste water treatment.

A patent for a process that treats decomposable wet sewage sludge in order to produce a partially dry humus-like material is described. The process involves partially drying a portion of the wet material, spreading this portion in the form of an absorbent pad, mixing an additional quantity of sewage sludge with the first portion in order to produce a mixture having an initial moisture content sufficient for the initiation of aerobic decomposition, and periodically turning the mixture under ambient atmospheric conditions in order to aerate it until decomposition ceases and the mixture is partially dry. The steps of wet material addition and aeration (periodic turning) are successively repeated, and a portion of the partially dry humus-like material is removed from the partially dried mixture at predetermined intervals. (Kreager-FIRL)
W76-12601

IMPROVEMENTS IN AND RELATING TO WASTE WATER TREATMENT,
South African Inventions Development Corp., Pretoria. (Assignee).
J. L. Barnard.
United States Patent 3,964,998. Issued June 22, 1976. Official Gazette of the United States Patent Office, Vol. 947, No. 4, p 1722-1723, June, 1976. 1 fig.

Descriptors: *Patents, *Waste water treatment, *Biological treatment, *Activated sludge, *Nitrogen, Organic wastes, Nitrogen compounds, *Denitrification.

A nitrogen removal process for organic waste water containing nitrogenous compounds was patented. Waste water and activated sludge recycled from a subsequent stage are fed to the first biological denitrification stage. Turbulence is induced to mix the activated sludge and waste water, producing a mixed liquor. Heterotrophic bacteria suspended in the activated sludge convert nitrates into nitrogenous gases under anoxic conditions. Mixed liquor from this stage passes to the second stage which is aerated to maintain a dissolved oxygen concentration between 0.2 and approximately 6 mg/liter. Nitrifying activated sludge bacteria biologically nitrigy nitrogenous compounds, producing nitrates. Mixed liquor containing nitrates formed in this stage is recycled to the first stage at a daily average of at least 0.8 times the first stage feed rate, by volume, of waste water. The mixed liquor residence time in the first stage is sufficient to denitrify 80% by weight or more of the recycled nitrates. Mixed liquor is passed from the nitrification stage to another stage where turbulence is induced, and mixed liquor residence time is sufficient for endogenous bacterial respiration to reduce oxygen and then convert 60% by weight or more of the nitrates to nitrogen gas. Mixed liquor is then passed to a solids separation stage to produce an activated sludge with a concentrated bacteria suspension and a clarified effluent. Clarified effluent is withdrawn from the separation stage. (Snyder-FIRL)
W76-12603

APPARATUS FOR BIOLOGICAL PURIFICATION OF AN EFFLUENT,
J. R. Kaelin.
United States Patent 3,965,009. Issued June 22, 1976. Official Gazette of the United States Patent Office, Vol. 947, No. 4, p 1726, June, 1976. 1 fig.

Descriptors: *Patents, *Waste water treatment, *Biological treatment, *Activated sludge, *Treatment facilities, Effluents, Equipment, Basins.

An apparatus was patented for biologically purifying an effluent. It includes two identical basins which are sealed gas-tight at their top portion and have a common wall. This common wall has through passages interconnecting the basins. The effluent being purified is fed alternately to each basin. The purified water is then discharged alternately from each basin. When the concentration of activated sludge in one basin falls below a specified level, the operation changes direction; the other basin serves as the activated sludge basin and the first basin serves as a final purification basin. An aeration impeller is provided for enriching the effluent with oxygen or a mixture containing oxygen and for agitating the effluent in the basin functioning as the activated sludge basin. The impeller is double-sided and has a supply line for oxygen that extends into one of its intake openings. A slide that is vertically movable is provided in the upper part of the common wall to open and close a passage in its upper end. Rails and rollers are provided to reciprocally support the aeration impeller on the basins and to slidably move the aeration impeller through the movable passage between the basins. Excess oxygen is removed from the upper part of the basins. (Snyder-FIRL)
W76-12604

SEWER LAYING SYSTEM,
For primary bibliographic entry see Field 8B.
W76-12605

LIVING FILTER PERKS UP REGIONAL SYSTEM,
Keifer Associates, Inc., Chicago, Ill. Western Michigan Office.
R. L. Lappo.
Water and Wastes Engineering, Vol. 13, No. 6, p 18-22, 33, 44, June, 1976. 2 fig, 3 tab.

Descriptors: *Irrigation, *Waste water treatment, *Water reuse, *Symbiosis, Domestic wastes, Industrial wastes, Oxidation lagoons, Biological treatment, Aeration, Chlorination, Treatment facilities, Michigan, Regional development, Soil filters, *Filtration.
Identifiers: *Muskegon County(Mich), *Soil filtration.

An irrigation system for treating waste water from 13 cities and towns and five major industries in Muskegon County, Michigan is described. Raw waste water is pumped 11 miles through a 66-inch reinforced concrete force main to a waste water treatment facility. The raw sewage is intensively oxygenated for three days by mechanical aeration and then stored in lagoons that function as oxidation and settling ponds. Effluent ready for irrigation is discharged through an outlet lagoon which has a surface area of 14 acres and a working depth of 12 feet. Immediately prior to irrigation, the water passes through a chlorinator for disinfection. Tertiary treatment is obtained by passing the effluent from the lagoon treatment facilities through the aerobic soil zone. The irrigation facilities are designed to apply the annual supply of waste water during a 7-month irrigation season. The daily average influent to the system is 28.5 million gallons/day, with 40% of it being domestic and 60% industrial. (Kreager-FIRL)
W76-12607

MASS TRANSFER LIMITATIONS ON TRICKLING FILTER DESIGN,
California Univ., Davis. Dept. of Civil Engineering.
E. D. Schroeder, and G. Tchobanoglous.
Journal Water Pollution Control Federation, Vol. 48, No. 4, p 771-775, April, 1976. 4 fig, 5 ref.

Descriptors: *Mass transfer Rates, *Trickling f ters, *Oxygen, Performance, *Waste water trea ment, Biochemical oxygen demand, *Desi criteria, Odor, Kinetics, *Filters, Filtration
Identifiers: Oxygen transfer rate

The limiting effect of the oxygen transfer rate trickling filter performance is discussed. There a pears to be no real understanding as to what exte oxygen transfer must be limited before proble occur, and it is not possible to obtain more tha rough estimate of the maximum influent orga concentration using available data. In many are of the country, there are periods, especially duri the summer, when essentially no air flow occu through trickling filters because temperature d ferentials are negligible; however, detailed repo on the results of no air flow are not documented the literature. The maximum applied biochemi oxygen demand concentration determined trickling filters packed with plastic media is e mated at 400 mg/liter and seems to be appropri for design purposes, although it is probably a c servative figure. When biochemical oxygen mand concentrations in excess of 500-600 mg/li are applied, the mass transfer rate of oxygen m become limiting. The probability of odor prod tion will also increase under these conditio (Kreager-FIRL)
W76-12608

COLESHILL (1): EXPERIMENTING WI WASTE WATER TREATMENT,
N. Banks.
Water, No. 8, p 20-22, May, 1976.

Descriptors: *Pilot plants, *Treatment facilit *Tertiary treatment, *Waste water treatme Equipment, Biological treatment, Flocculati Activated carbon, Filtration, Aeration, Sett basins, Monitoring, Instrumentation, Progra Design, *Design criteria.
Identifiers: Physico-chemical treatment, Un Kingdom.

The design of an advanced waste water treatm pilot plant in the United Kingdom which was c structed as a result of a study on advanced wa water treatment methods by the Committee on Challenges of Modern Society is described. design involves parallel feed streams of wa water piped along both faces of a fixed gantry mobile treatment units which may be connecte any order to either feed stream. Units dealing physico-chemical treatment include: chem flashmixing and flocculation tanks and multim and activated carbon filters. There are acid/alkaline adjustment facilities and a fixed stallation for preparing and dosing chemials. bile units for conventional biological treatm processes include surface aeration tanks and h rate biological filters. Five pairs of mobile set tanks and a fixed installation for sludge treatm are common to both the physico-chemical biological treatment processes. Plant performa is monitored by portable sensors which tran data to a central data-logging installation. (See W76-12610) (Kreager-FIRL)
W76-12609

COLESHILL (2): INCINERATING SEWA SLUDGE,
For primary bibliographic entry see Field 5E.
W76-12610

AMMONIA REMOVAL FROM WASTEWA BY LIGAND EXCHANGE,
National Environmental Research Center, Ci nati, Ohio.
R. A. Dobbs, S. Uchida, L. M. Smith, and J. M Cohen.
Adsorption and Ion Exchange, Vol. 152, No. 157-163, 1975. 7 fig, 4 tab, 11 ref.

UNIVERSITY OF ILLINOIS-URBANA-CHAMPAIGN

Descriptors: *Ion exchange, *Ammonia, *Waste water treatment, *Municipal wastes, Feasibility studies, Evaluation, Performance, Chemical reactions, Phosphates, Sulfates, Alkalinity.
Identifiers: *Ligand exchange.

The technical feasibility of removing ammonia from municipal waste water by a ligand exchange process was demonstrated along with the subsequent regeneration of the exhausted exchanger with low pressure steam. An ion exchanger containing hydrous zirconium oxide was converted to the cupric form for removing ammonia by the mechanism of ligand exchange. Copper bleed during loading was less than one microgram/liter of copper. The pH of the waste water being treated was found to be important since undissociated ammonia rather than ammonium ion was the species involved in the reaction; the optimum pH range was between 10 and 11. The common waste water anions, phosphate and sulfate, did not compete with ammonia at concentrations of 10 and 100 milligrams/liter, respectively; and no exchange in ammonia capacity was observed in the presence of these ions. The exhausted exchanger was readily regenerated by steam at a temperature of 135 C. Additional research is needed to establish the process as an alternative for ammonia removal. (Kreager-FIRL)
W76-12611

COMPACT INCINERATOR FOR SOLID AND LIQUID WASTES.
For primary bibliographic entry see Field 5E.
W76-12612

SEWAGE PLANT UPGRADES EFFLUENT.
Water and Sewage Works, Vol. 123, No. 6, p 72-73, June, 1976.

Descriptors: *Recycling, *Sewage treatment, *Treatment facilities, *Costs, *Water reuse, Filtration, *Effluents, Solid wastes, Equipment, Efficiencies.

The recycling of secondary treatment effluent has significantly improved the efficiency of internal operations at the Metropolitan Denver Sewage Disposal District Number 1 plant near Commerce City, Colorado. A portion of the effluent from the secondary clarifiers is used for several utility functions normally requiring clean tap water. An Adams VWS-16 Automatic Water Strainer is used to remove solids from the secondary treatment effluent prior to recycling. The strainer is equipped with Poroedge tubes with a slot width of 0.010 in and is designed for automatically programmed backwash based on the total pressure drop across the system. During the backwash cycle, the tubes are backwashed sequentially, one tube at a time, and the backwash water is returned to the system input. The recycled water is available at virtually no cost and affords a significant savings over municipal tap water used for the same purpose. (Kreager-FIRL)
W76-12613

SUBMERSIBLE PUMPS UPGRADE SEWAGE HANDLING.
Water and Sewage Works, Vol. 123, No. 6, p 70-, June, 1976.

Descriptors: *Pumping plants, *Sewage disposal, Subsurface flow, *Municipal wastes, *Pumps, Equipment, *Waste water treatment, Treatment facilities, Efficiencies, Maintenance, Mechanical equipment, Sanitary engineering, Waste water disposal.
Identifiers: *Submersible pumps.

The use of submersible pumps in the city of Belleville, Illinois to upgrade sewage handling is discussed. In addition to more efficient waste water handling, submersible pumps also offer the following advantages: only a single wet well is required; only one discharge valve is required for each pump, and no influent valve is required; accessory equipment such as fans, dehumidifiers, ladders, and lights is unnecessary; and maintenance and repair requirements are reduced. The submersible stations being installed in Belleville are all of the duplex type, each equipped with a pair of Flygt electric submersible pumps. Thus far, the installation of submersible pumps has saved about 3 hours each day in maintenance and inspection time. Another advantage of submersible stations is the relative ease of increasing station capacity as dictated by the growth of an area. At one pumping station, for example, the capacity was tripled by simply changing pumps and two components in the control panel; no changes in piping or other modifications were required. (Kreager-FIRL)
W76-12614

TYPES OF MICRO-ORGANISMS IN ACTIVATED SLUDGE IN DEPENDENCE OF TEMPERATURE AND NITRIFICATION (DIE BESIEDLUNG DES BELEBTEN SCHLAMMES IN ABHAENGIGKEIT VON TEMPERATUR UND NITRIFIKATION),
For primary bibliographic entry see Field 5A.
W76-12615

ELIMINATION OF TRACE-ELEMENTS BY SLOW-SAND-FILTRATION (ELIMINIERUNG VON SPURENMETALLEN DURCH LANGSAM-SANDFILTER),
U. Schoettler.
Zeitschrift fuer Wasser- und Abwasserforschung, Vol. 9, No. 3, p 88-93, 1976. 17 fig, 1 tab.

Descriptors: *Waste water treatment, *Biological treatment, *Treatment facilities, *Trace elements, *Filtration, Sands, Zinc, Cadmium, Copper, Lead, Chromium, Metals.
Identifiers: *Sand filters, Slow sand filtration, Arsenic.

The behavior and cleansing capacities of a biologically based filtration system for zinc, cadmium, copper, lead, arsenic, and chromium were estimated by long-term tests with simulated slow-sand-filtration. EDTA's remobilizing ability was subsequently tested, underscoring complexing agents which are important in water treatment. Algae and the sand used for filtration were analyzed to determine changes during testing. The filters sufficiently eliminated all trace-elements except cadmium and arsenic. (Snyder-FIRL)
W76-12616

WASTE WATER TREATMENT -- A NEW CONCEPT (EPURATION D'EAUX RESIDUAIRES -- NOUVELLE CONCEPTION).
Informations Chimie, No. 152, p 165-166, February, 1976. 1 tab.

Descriptors: *Waste water treatment, *Biological treatment, *Adsorption, *Percolation, *Suspended solids, Chemical oxygen demand, Biochemical oxygen demand, Activated carbon.
Identifiers: *Tecflow.

When activated carbon is located downstream from a biological waste water treatment installation, adsorption is frequently blocked by bacteria colonies. By placing the activated carbon upstream, the water's pH is kept fairly low, thereby minimizing bacterial growth. To optimize these conditions, a material was developed, Tecflow, which, in a first zone, acts as a fluidized bed adsorbent, and, in a second zone, as a fixed bed adsorber floating on the fluidized bed. This system allows for the percolation of waters containing up to 100 mg of suspended matter, thereby avoiding primary decantation which generally produces diluted and hard to dispose of sludge. A blockage of about 20% COD will lower toxicity concentrations by 50-70% after passage on Tecflow. Trials in a waste water plant producing 1,000 cu m/d of various solvent and industrial wastes effected a 99% BOD and 98% COD decrease. (Waltner-FIRL)
W76-12617

PERFORMANCE COMPARISON SURVEY OF THE PUBLIC SEWAGE-TREATMENT PLANTS IN BADEN-WUERTTEMBERG 1975 (LEISTUNGSVERGLEICH FUER KLAERANLAGEN 1975 IN BADEN-WUERTTEMBERG),
C-H. Burchard.
Forum Umwelt Hygiene, Vol. 27, No. 5, p 175-177, 1976. 3 tab, 3 ref.

Descriptors: *Waste water treatment, *Sewage treatment, *Sewerage, *Treatment facilities, Europe, Public utilities, Training, Water purification, *Performance.
Identifiers: *Baden-Wurttemberg(Germany).

Since 1972 Baden-Wurttemberg has had codes controlling public sewage treatment plants. Advanced training for operators of sewage works provides the necessary knowledge for bringing about this control. A 'Performance Comparison Survey' of the public sewage treatment plants in Baden-Wurttemberg was conducted for the second consecutive year in 1975. The purification procedure requirements were satisfied by 52% of the public sewage treatment plants operating in Baden-Wurttemberg. Outstanding purification performances were demonstrated by one out of seven plants. (Snyder-FIRL)
W76-12618

REMOVAL OF PHOSPHORUS AND NITROGEN FROM WASTEWATER BY SPRAY IRRIGATION OF LAND,
Michigan State Univ., East Lansing.
D. B. Shah.
Available from University Microfilms, Ltd., Ann Arbor, Mich., 48106, Order No. 76-12519. Ph.D. Thesis, 1975, 287 p.

Descriptors: *Waste water treatment, *Phosphorus, *Nitrogen, *Irrigation, *Waste water(Pollution), Adsorption, Nitrification, Denitrification, Mathematical models, Soil water movement, Soils.

Spray irrigation of land is being considered for the removal of phosphorus and nitrogen from waste water. Various reactions such as phosphorus adsorption, nitrification, and denitrification were studied, and mathematical models were developed to predict their movements in soil. The phosphorus model was derived using material balances on water and on phosphorus in the liquid and solid phase. It was assumed that non-equilibrium conditions prevail between phosphorus concentration in the liquid phase and on the soil. The water transport equation was dropped when it was determined that the water front moved much faster than the phosphorus front. Results of the simulation compared remarkably well with data from a spray irrigation site, and the soil system was efficient in phosphorus removal. Kinetic constants for the nitrification and denitrification reactions were evaluated. It was determined that nitrification can be considered a first order reaction in the range of nitrate concentrations encountered in waste water and that three times as much organic carbon is required as nitrate nitrogen for complete nitrogen removal. Material balance equations were written for ammonium nitrogen and nitrate nitrogen in the liquid phase and all the gas phase components. The simulation results compared very well with the experimental results; complete nitrogen removal was not accomplished even at very low flow rates. The nitrogen removal ability of the soil was found to be more important than its phosphorus removal capability in selecting a land disposal site. (Snyder-FIRL)
W76-12619

KINETICS AND PROCESS CONTROL OF NITRIFICATION IN COMPLETELY MIXED BIOLOGICAL WASTEWATER TREATMENT,
Texas A and M Univ., College Station.
A. C. Petrasek, Jr.
Available from University Microfilm, Inc., Ann Arbor, Mich., 48106, Order No. 76-12687. Ph.D. Thesis, 1975, 232 p.

Descriptors: *Waste water treatment, *Activated sludge, *Chemical oxygen demand, *Biological treatment, *Control, Nitrification, Oxidation, Hydrolysis, Testing, Ammonia, Organic compounds.
Identifiers: *Sludge age, *Kinetics, Ammonia nitrogen, Organic nitrogen.

A study was undertaken to determine the nitrification kinetics in completely mixed activated sludge processes and define the nitrification process control requirements for these systems. The kinetics of ammonia nitrogen oxidation and organic nitrogen hydrolysis were evaluated with 25 batch tests under varying conditions. Organic nitrogen hydrolysis to ammonia nitrogen follows first-order kinetics; ammonia nitrogen oxidation has zero-order kinetics. The reaction rate for organic nitrogen hydrolysis was significantly faster than that for ammonia nitrogen oxidation. More importantly, the rate depended on sludge age. To further determine the complex relationships existing in biological waste water treatment processes, five years of data from the Demonstration Plant of the Dallas Water Reclamation Research Center were evaluated. Sludge age was the best indicator for microorganism growth rate. Excellent correlations were developed between sludge and ratio of food to microbes, gross yield coefficient and sludge age, sludge age and dissolved oxygen uptake rate, and sludge age and Kjeldahl nitrogen removal. The significant improvement in chemical oxygen demand (COD) removal for activated sludge system operation in which nitrification takes place was also quantified. Alkalinity's importance was identified in process control for nitrifying activated sludge systems. A decrease in alkalinity of 6.0 mg/liter is indicated for each 1.0 mg/liter of total Kjeldahl nitrogen that is removed or oxidized. The data also indicate that sludge age should be increased by 0.56 days for every Fahrenheit degree decrease in the temperature of the aeration basin. (Snyder-FIRL)
W76-12620

OPTIMAL TIMING AND SIZING OF A CONJUNCTIVE WATER SUPPLY AND WASTEWATER SYSTEM, USING NONLINEAR PROGRAMMING,
California Univ., Los Angeles.
For primary bibliographic entry see Field 5F.
W76-12621

WASTEWATER RECLAMATION AND RE-USE: THE RESPONSIBILITIES OF THE CONSULTING ENGINEER,
California Univ., Los Angeles.
C. H. Tate.
Available from University Microfilms, Inc., Ann Arbor, Mich. 48106, Order No. 75-26996. Ph. D. Thesis, 1975, 265 p.

Descriptors: *Waste water treatment, *Planning, *Design, *Water reuse, *Sanitary engineering, Public health, Costs, Treatment facilities.

The consulting engineer must provide sound input to all phases of waste water reclamation and reuse systems including initial planning, selection of a reclamation process and design of a reuse system. Prior to starting a waste water reclamation and reuse project, careful consideration should be given to preliminary factors including public health implications of reuse, applicable regulatory agency policies, and costs. The responsibilities of the consulting engineer in the various stages of waste water reclamation and reuse are illustrated by case studies. The planning process is described using the Comprehensive Water Quality Plan for the San Diego Basin. Testing, evaluation and selection of a recommended reclamation process are discussed with respect to the Prototype Plant Study for the Chino Basin Municipal Water District. The Expansion of the Wastewater Treatment Plant at Walt Disney World, Florida, is discussed as an example of reuse systems. (Orr-FIRL)
W76-12622

THERMOPHILIC AEROBIC MICROBIOLOGICAL TREATMENT OF HIGH STRENGTH WASTEWATERS AND RECOVERY OF PROTEIN,
Illinois Univ. at Urbana - Champaign.
G. A. Sueruecue.
Available from University Microfilms, Inc., Ann Arbor, Mich. 48106. Order No. 75-24413. Ph. D. Thesis, 1975, 164 p.

Descriptors: *Biological treatment, *Aerobic treatment, *Waste water treatment, Microorganisms, Bacteria, Chemical oxygen demand, Nutrient requirements, *Thermophilic bacteria.
Identifiers: Mesophilic bacteria, Solids retention time.

The thermophilic aerobic treatment of high strength waste waters was studied in both batch and continuous flow systems. The growth requirement of thermophilic organisms in mixed culture, the kinetic behavior of the culture, the effects of solids retention time on the system, and the protein content of the harvested biomass were considered. The rate of growth was highest at 58C. The minimal nutritional requirements for the organisms included methionine, magnesium, calcium, and iron as well as carbon, nitrogen, and phosphorus. The maximum removal of soluble organic matter was obtained when the system was operated with a solids retention time (SRT) of 5 days or more. A one day SRT achieved 85% COD removal, a 2 day SRT achieved 90% removal, and after 5 days the COD removal was 95%. The specific oxygen utilization rate depended upon the solid concentration and the specific substrate utilization rate which were themselves dependent upon the SRT. No nitrification occurred in any of the SRT systems studied. The thermophilic process is capable of treating high strength waste water more effectively and rapidly and of producing less sludge than a mesophilic system. The biomass produced contained about 45% protein. (Orr-FIRL)
W76-12623

ION EXCHANGE REMOVAL OF INORGANIC AND ORGANIC WASTEWATER CONSTITUENTS,
Colorado Univ., Boulder.
T. Panswad.
Available from University Microfilms, Inc., Ann Arbor, Mich. 48106. Order No. 75-23632. Ph. D. Thesis, 1975, 242 p.

Descriptors: *Waste water treatment, *Ion exchange, *Municipal wastes, *Water reuse, Activated carbon, Chemical oxygen demand, Resins, Anions, Operating costs, Organic compounds, Inorganic compounds.

A study was conducted jointly by the Denver Water Board and the University of Colorado on the use of ion exchange for demineralizing the Denver Metro waste water. Two anionic resins, Duolite S-37 and A-30B, were studied for their structure and capabilities in simultaneous removal of organic and inorganic materials. The resins were tested in conjunction with a weak acid-strong acid cationic exchanger couple. Using weak base resins prior to and after the cationic couple achieved about a 20% removal of COD. The system consisting of a cationic couple and a degasifier followed by an anionic resin bed was optimized. This system was capable of removing all sulfate ions, about 83% of the chloride ions and 95% of the orthophosphate over a 200 bed volume throughput. When the system employed S-37 resin, average COD removal was 64.6%. COD removal averaged 50.1% when A-30B resin was used. Treatment costs were 29.4 and 27.1 cents/1000 gallons of water treated with S-37 and A-30B, respectively. The addition of activated carbon columns to the end of systems increased the overall average COD removal to 82.6 and 79.2% from the systems containing the S-37 and A-30B resins. The increase in treatment cost was 7.1 and 8.4 cents/1000 gallons, respectively. (Orr-FIRL)
W76-12624

NITRATE REDUCTION IN PEAT,
Minnesota Univ., Minneapolis.
B. A. Jaouich.
Ph. D. Thesis, 1975, 149 p.

Descriptors: *Waste water treatment, *Peat, Nitrogen compounds, *Denitrification, Biological treatment, Microorganisms, *Nitrates, Pseudomonas.

The reduction and removal of nitrogen compounds by biological denitrification in peat using three types of peat, Fibric, Hemic, and Sapric, were studied. Waste water from a local treatment plant was added to 60 cm deep columns of peat at different rates of application. Solutions of nitrate nitrogen from 10 mg/liter to 1000 mg/liter were added to the waste water to test the capacity and duration of the peat renovation system. With residence times between 1.75 and 7 days, Fibric peat was the most promising material for nitrogen removal, followed by Sapric and Hemic. The evolution of nitrous oxide and carbon dioxide was used as an index of biological denitrification. The concentrations of these gases increased as the amounts of nitrate nitrogen added increased. At the end of the experiment, the concentrations of total nitrogen had decreased in the upper layers of Fibric and Sapric but were generally higher in Hemic. The concentrations of total carbon had decreased most in Hemic followed by Sapric and Fibric. Representative strains of denitrifying Pseudomonas spp., isolated from the peats, were most abundant in Fibric followed by Hemic and Sapric. It was shown that the isolated Pseudomondaceae reduced the added nitrates to elemental nitrogen. The peat water renovation system is an effective and inexpensive method for solving waste water problems where suitable land is available. Performance is excellent and operation is relatively simple. (Orr-FIRL)
W76-12625

URBAN RUNOFF AND COMBINED SEWER OVERFLOW, (LITERATURE REVIEW),
Environmental Protection Agency, Edison, N. Wastewater Research Div.
R. Field, J. Curtis, and R. Bowden.
Journal Water Pollution Control Federation, V. 48, No. 6, p 1191-1206, June, 1976. 156 ref.

Descriptors: *Urban runoff, *Urban drainage, *Overflow, *Sewers, *Combined sewers, Flow control, Indicators, Coliforms, Phosphates, Land use, Monitoring, Planning, Water quality control, Storm water, Storm runoff, Sampling, Legislation, Legal aspects, Model studies, *Reviews, *Bibliographies.
Identifiers: *Literature reviews.

A literature review of documents dealing with urban runoff and combined sewer overflow is presented. General topics covered include: urban runoff quality, receiving water impacts, the monitoring of urban runoff pollutants, water quality control planning, runoff pollution modeling, flow regulation and control, and legislation for controlling urban drainage. Specific subjects discussed under the above general headings include: the effects of suburban development on runoff, a comparison of urban, watershed pollu-

levels with those in forested watersheds, the use of coliform and orthophosphate levels as indicators of stormwater impact, the suitability of automatic sampling and monitoring equipment for storm and combined sewer systems, required elements of a master plan for water quality control of combined sewer systems, data required for verifying stormwater models, design procedures for calculating settleable solids removal efficiency for combined sewer overflow regulators, and a model urban drainage ordinance. (Kreager-FIRL)
W76-12627

MICROBIOLOGY OF WASTE TREATMENT, (LITERATURE REVIEW),
Pennsylvania State Univ., University Park.
R. F. Unz.
Journal Water Pollution Control Federation, Vol. 48, No. 6, p 1367-1378, June, 1976. 101 ref.

Descriptors: *Microbiology, *Waste water treatment, *Microorganisms, Nutrients, Bacteria, Viruses, Polymers, Metals, Ions, Toxicity, Activated sludge, Treatment facilities, Biodegradation, Byproducts, Suspended solids, Adsorption, Flocculation, Nitrilotriacetic acid, Phosphates, Analytical techniques, *Reviews, *Bibliographies.
Identifiers: *Literature reviews.

A literature review of papers dealing with the microbiology of waste water treatment is presented. General topics covered include: sanitary microbiology and disinfection, waste water microbial dynamics, the toxicity of metal ions, the behavior of biopolymers, the existence of nuisance microorganisms, the nutrient composition of waste waters, biodegradation, anaerobic microbiology, and the occurrence of microbial byproducts as a result of waste water treatment. Specific topics discussed under the above general headings include: the development of selective agars for the recovery of fecal streptococci from waste water, changes in the composition and density of microbial populations in waste water transported through activated sludge treatment plants, methods for determining the biodegradable fraction of activated sludge, the degradation of metal chelated nitrilotriacetate complexes by Pseudomonas strains of bacteria, the failure of Leuconostoc mesenteroides to flocculate during the synthesis of an extracellular polymer, luxury phosphate uptake by activated sludge, the development of a shake flask procedure for the biodegradability screening of pollutants, and studies of single cell protein production in synthetic waste waters. (Kreager-FIRL)
W76-12628

WASTEWATER TREATMENT - PHYSICAL AND CHEMICAL METHODS, (LITERATURE REVIEW),
Massachusetts Univ., Amherst. Dept. of Civil Engineering.
J. B. Scaramelli, and F. A. DiGiano.
Journal Water Pollution Control Federation, Vol. , No. 6, p 1086-1096, June, 1976. 112 ref.

Descriptors: *Waste water treatment, *Membrane processes, *Coagulation, *Separation techniques, Ion exchange, *Reverse osmosis, *Adsorption, Ozone, Activated carbon, Chemical precipitation, Phosphorus, Lime, Organic acids, Ammonia, Environmental effects, Treatment facilities, Chemical properties, Physical properties, *Reviews, *Bibliographies.
Identifiers: *Literature reviews.

A literature review of physical and chemical methods of waste water treatment is presented. General topics covered include: process applications, coagulation and solids separation, adsorption, ion exchange, membrane processes, and ozonation. Examples of specific topics discussed under the above general headings include: quantitative evaluations of the total environmental impact of advanced waste water treatment, studies of the precipitation of phosphorus with lime, a comparison of the adsorptivity of activated carbons produced from lignite and bituminous coal, the use of ion exchange resins for the removal of humic acids, the use of reverse osmosis coupled with conventional waste water treatment, and the use of ozone for the removal of ammonia from waste water. (Kreager-FIRL)
W76-12629

SLUDGE TREATMENT, UTILIZATION, AND DISPOSAL, (LITERATURE REVIEW),
Delaware Univ., Dept. of Civil Engineering. Newark.
R. I. Dick.
Journal Water Pollution Control Federation, Vol. 48, No. 6, p 1137-1166, June, 1976. 340 ref.

Descriptors: *Sludge treatment, *Sludge disposal, *Reclamation, Industrial wastes, Waste water treatment, Activated sludge, Spectrophotometry, Suspended solids, Analytical techniques, Byproducts, Oceans, Land use, Phosphorus, Heavy metals, Hazards, Polymers, Treatment facilities, Pulp and paper industry, Septic tanks, *Reviews, *Bibliographies.
Identifiers: *Literature reviews.

A literature review of papers dealing with the treatment, utilization, and disposal of sludge is presented. Topics covered include: problems encountered by the Environmental Protection Agency in securing public support for land-based alternatives to ocean disposal, regional industrial sludge reclamation and disposal facilities, the treatability of sludges removed from septic tanks, options for sludge treatment and disposal in the pulp and paper industry, the effects of various phosphorus removal techniques on the quantity and quality of sludge produced at waste water treatment plants, processes for improving the dewatering of activated sludges, the heavy metal contents of different sludges, an automated spectrophotometric technique for measuring the suspended solids concentration of activated sludge, the influence of sludge characteristics and polymer properties on the selection of polymers for chemical sludges, direct slurry freezing of activated sludge using butane, the application of dissolved air flotation thickening to mixed primary and secondary sludges, the pyrolysis and combustion of sludge, industrial uses for sludge, problems associated with the ocean disposal of sludge, and potential hazards associated with the ocean disposal of sludge, and potential hazards associated with the application of sludge on agricultural land. (Kreager-FIRL)
W76-12630

WASTEWATER COLLECTION, (LITERATURE REVIEW),
Nottingham (H. D.) and Associates, Inc., McLean, Va.
T. Singh, and J. S. Bhutani.
Journal Water Pollution Control Federation, Vol. 48, No. 6, p. 1170- 1174, June, 1976. 42 ref.

Descriptors: *Sewers, *Conveyance structures, *Waste water treatment, Pipelines, Pumping plants, Infiltration, Inflow, Separated sewers, Materials, Monitoring, Inspection, Maintenance, Economics, Planning, Design criteria, Repairing, *Reviews, *Bibliographies.
Identifiers: *Collection systems(Sewers), *Literature reviews.

A literature review of papers dealing with waste water collection is presented. General topics covered include: planning, design, and construction considerations; inspection, monitoring, and maintenance activities; waste water pumping; and economic considerations. Specific subjects discussed under the above general headings include: the separation of combined collection systems into sanitary and storm sewers, the use of polyethylene pipe for collection systems, the advantages of pressure sewers over conventionally used gravity flow collection systems in areas with difficult terrain, a management program for the operation and maintenance of a waste water collection system, the restoration of deteriorated sewers, the limitations of current methods for identifying infiltration/inflow in sewer systems, improvements in the capability of existing lift stations, and the economic impact of infiltration and inflow problems associated with waste water collection systems. (Kreager-FIRL)
W76-12631

SECOND ATTEMPT TO TREAT ANGLIA'S TOXIC WASTES,
P. Millbank.
Surveyor, Vol. 147, No. 4380, p 17, May 21, 1976. 1 tab.

Descriptors: *Waste water treatment, *Biological treatment, *Treatment facilities, *Industrial wastes, *Liquid wastes, Reclamation, Foreign countries, Attitudes.
Identifiers: *Physical treatment, *Chemical treatment, *Toxic wastes, United Kingdom.

Hales Industrial Services have re-applied to build an industrial liquid waste reclamation and treatment plant near Bury St. Edmunds, Suffolk. A previous application 3 yr ago provoked much local controversy, and the county planning committee finally rejected it. The new application omits incineration, which had attracted the most local criticism. The new plant is considered to be very much in the country's interests. It also has implications for surrounding counties. The plant will reduce the long distance haulage of waste material. The objectives of the plant are to recover scarce materials, render wastes harmless, and offer reprocessing. Physical treatment will involve separation and filtration; chemical treatment will use reagents; and biological treatment will employ a high-rate filter. Up to 17,000 gallons of de-contaminated water and 30 tons of filter cake will be generated daily. The climate of informed opinion has shifted significantly in the direction of more regionalized treatment and disposal of notifiable wastes compared to when the original application was made. (Snyder-FIRL)
W76-12632

DESIGN OF INTEGRATED APPROACH TO NUTRIENT REMOVAL,
Brown and Caldwell, Walnut Creek, Calif.
D. L. Eisenhauer, R. B. Sieger, and D. S. Parker.
Journal of the Environmental Engineering Divisions, Proceedings of ASCE, Vol. 102, No. EE1, p 37-54, February, 1976. 6 fig, 11 ref, 1 append.

Descriptors: *Waste water treatment, *Biological treatment, *Treatment facilities, *Water reuse, *Integrated control measures, Nutrients, Design, Reclamation, Reclaimed water, Industrial water, *Nutrient removal, *Design criteria, California.

The Central Contra Costa Sanitary District's Water Reclamation Plant currently being built near Concord, California, will produce water for industries located along the shores of Suisun Bay. Four miles of pressure pipeline will link the industries to the plant. Seventy-five percent of the reclamined water will be used for cooling and the remainder for process purposes. Reclaimed water in excess of industrial needs will be discharged to the bay. It will not harm the receiving waters because it will be virtually free of oxygen demanding materials, nutrients, and toxicants. The plant was designed following 2 yr of testing at the Advanced Treatment Test Facility (ATTF) at the site of the CCCSD's existing treatment plant. The new plant's treatment system combines lime clarification in the primary sedimentation tanks, biological nitrification-denitrification, a multimedia rapid sand filtration system for effluent polishing, a two-state sludge conditioning process, and a wet and dry lime classification process with recalcining

and lime recovery. The plant is designed for expansion and will be constructed in increments as the need arises. Nitrogen will be removed to prevent algal growth in receiving waters and industrial water systems. Phosphorus will be removed to control calcium-phosphate scaling. A dual computer system will monitor and control the entire plant process. (Snyder-FIRL)
W76-12635

INFLUENCE OF ACTIVATED SLUDGE CRT ON ADSORPTION.
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
B. R. Kim, V. L. Snoeyink, and F. M. Saunders.
Journal of the Environmental Engineering Division Proceedings of ASCE, Vol. 102, No. EE1, p 55-70, February, 1976. 12 fig, 2 tab, 21 ref, 1 append.

Descriptors: *Waste water treatment, *Activated sludge, *Chemical oxygen demand, *Treatment facilities, *Adsorption, Organic compounds, Effluents, Sewage treatment.
Identifiers: *Cell residence time.

The relationship between the operational characteristics of an activated sludge system and the concentration of nonadsorbable organic compounds present in the secondary effluent was studied. Activated sludge units were operated at cell residence times (CRT) of 0.8 days, 4.8 days, 12.3 days, and 19.4 days. Batch adsorption tests were conducted using secondary effluent from these systems. The equilibrium chemical oxygen demand (COD) for each was determined as a function of carbon dosage. Membrane separation techniques were used to fractionate the organic matter by size, in order to study the adsorption by activated carbon of the size fractions. Continuous flow column studies were also conducted. The CRT of an activated sludge system significantly affects the concentration of nonadsorbable organic matter in the effluent from the system. There was little change in the concentration of adsorbable material, however, particularly as the CRT was increased from 4.8 days to 19.3 days. The concentration of nonadsorbable material was not significantly affected by pH changes. Some nonadsorbable organic matter was present in each size fraction. Relatively simple laboratory batch tests can be used to determine the amount of nonadsorbable material in a waste water and thus to predict the best possible effluent achievable with a carbon column in the absence of biological activity. CRT should be considered as a new variable in addition to those currently used in designing treatment systems. The manner in which the secondary biological system is operated should be considered in any subsequent treatment of the effluent by activated carbon. (Snyder-FIRL)
W76-12636

PERFORMANCE OF SINGLE HOUSEHOLD TREATMENT UNITS,
Wisconsin Univ., Madison. Dept. of Civil and Environmental Engineering.
R. J. Otis, and W. C. Boyle.
Journal of the Environmental Engineering Division Proceedings of ASCE, Vol. 102, No. EE1, p 175-189, February, 1976. 6 fig, 5 tab, 8 ref, append.

Descriptors: *Waste water treatment, *Pollutant identification, *Biochemical oxygen demand, *Chemical oxygen demand, *Treatment facilities, *Domestic wastes, *Performance, Anaerobic conditions, Aerobic treatment, On-site tests, Septic tanks.

Eight installations at private homes in Wisconsin were used to test anaerobic and aerobic household waste treatment processes. These included six systems with single compartmented septic tanks, one with two septic tanks in series, two with continuous flow-through extended aeration units, and one with a batch aeration unit. Samples from each step in the treatment process were analyzed for biochemical oxygen demand (BOD), chemical oxygen demand (COD), solids, total nitrogen, phosphorus, total and fecal coliform, and fecal streptococcus. Effluents from aerobic units had mean concentrations of mg/liter BOD and 53 mg/liter total suspended solids (TSS) as compared to 158 mg/liter BOD and 54 mg/liter TSS in septic tank effluent. Most of the aerobic processes, however, would not meet current national secondary effluent BOD and TSS criteria without modification or additional processing. Septic tanks were more stable in seven of the 11 parameters tested. Nearly complete nitrification and some denitrification occurred in the aerobic units; ammonia and organic nitrogen dominated in septic tank effluent. The following appear beneficial in maintaining high effluent quality from aerobic units: a septic tank or trash trap preceding the aeration chamber to remove grease, floating solids, and large debris; flow equalization; returning floating solids at least twice daily; maintaining mixed liquor temperatures above 15C; effluent weirs at least 24 in. long with scum and deflection baffles; and regular maintenance with inspections at least ever 2 mo. (Snyder-FIRL)
W76-12637

ALBUQUERQUE PLANT DESIGNED WITH COMPUTER IN MIND,
William Matotan and Associates, Albuerque, New Mex.
J. L. Ricoy, and W. I. Matotan.
Water and Wastes Engineering, Vol. 13, No. 1, p 32-35, 37, January, 1976.

Descriptors: *Treatment facilities, *Waste water treatment, New Mexico, Activated sludge, Trickling filters, *Aeration, Computers, Equipment, Settlement basins, Anaerobic digestion, *Sewage treatment, Waste disposal.
Identifiers: Process control, Albuquerque(NM), Screw pumps.

A new secondary treatment plant in Albuquerque is described. The new activated sludge waste water treatment plant includes a process control computer system, new laboratory testing equipment, and monitor sensors. The two existing plants incorporates trickling fpuilters. In the new scheme, effluents from the two old plants combine and pass through a series of screw pumps to the aeration tanks, the final settling tanks, and then to the Rio Grande river for disposal. Aeration facilities were designed so that the plant can operate as either conventional taped aeration, step aeration, or contact stabilization. Diffused air is used for mixing and oxygen needs. Final settling tanks are of rapid sludge removal type. Anaerobic digestion handles sludge solids, and the resulting gas is used to generate electricity through the system. Pumps and blowers are controlled by the computer on the basis of a running time inventory. This is also used an aid in determining maintenance and overhaul schedules. Dissolved oxygen levels in the aeration tanks are continuously monitored by the computer. Algorithms are provided in the system for a wide variety of controls and samplings. The computer has a fixed head mass memory of 246K and a core memory of 24K, both expandable. (Pinto-FIRL)
W76-12638

WASTEWATER TREATMENT FACILITY, PARIS UTILITY DISTRICT,
Consulting Engineer, Vol. 46, No. 6, p 67, June, 1976. 1 fig.

Descriptors: *Waste water treatment, *Treatment facilities, *Utilities, *Food processing industry, *Cities, Domestic wastes, Tannery wastes, Industrial wastes.

Two industries and a town worked together for over a decade developing a sophisticated waste water treatment facility. The industrial-municipal plant, designed for combined domestic, tannery, and food processing wastes, eliminated the necessity for separate facilities. The two industries which had previously discharged inadequately treated waste to the Little Androscoggin River now satisfy state and Federal waste discharge requirements. The city now has the services necessary for future industrial and residential development without river pollution. The facility treats about 1.35 mgd combined industrial and domestic wastes. The process controls and blends the waste streams for optimal performance, and incorporates several unusual operations. Automatic pumping systems for pH control optimize clarification removal and prevent release of odorous gases by sulfides in the waste. Chromium is removed by chemical precipitation brought about by equalizing two waste streams with pH control without added chemicals. Tannery stack gas serves as a carbon dioxide source reacting with free lime in industrial waste, forming calcium carbonate. Refractory chemical removal is optimized by unconventional upflow clarifiers. Maintenance and operation costs are reduced by separate sludge centrifugation. Other features that reduce cost and improve efficiency include a multiuse pumping system, automatic recording process control and alarm systems, and a space and cost saving 800-kw turbine engine. (Snyder-FIRL)
W76-12639

SEPTIC TANK EFFICIENCY,
ADI Ltd., Fredericton (New Brunswick).
T. Viraraghavan.
Journal of the Environmental Engineering Division Proceedings of ASCE, Vol. 102, No. EE2, p 505-508, April, 1976. 3 tab, 2 ref, 1 append.

Descriptors: *Waste water treatment, *Pollutant identification, *Sewage treatment, *Sewerage, *Treatment facilities, Biochemical oxygen demand, Chemical oxygen demand, *Septic tanks, Efficiencies.

A study on the actual performance of a rural household septic tank was carried out for the year 1973. Samples of raw sewage and septic tank effluent were analyzed for pH, total suspended solids (TSS), biochemical oxygen demand (BOD), chemical oxygen demand (COD), soluble organic carbon (SOC), total phosphates (P04-P), ammonia nitrogen, nitrate nitrogen, total soluble iron, chlorides, total coliforms, fecal coliforms, fecal streptococci, Standard Plate Count (SPC), and Pseudomonas aeruginosa. About 20% of the TSS and 50% of COD and BOD were removed by the septic tank. There was very little indicator organism removal. However, over 80% of Pseudomonas aeruginosa was removed by the septic tank. Low removals of TSS and bacteria may result from re-entrainment of sedimented material into the effluent stream. (Snyder-FIRL)
W76-12640

ALUM SLUDGE DRYING WITH BASIC EXTRACTIVE TREATMENT,
Resources Conservation Co., Renton, Wash.
For primary bibliographic entry see Field 5E.
W76-12641

A NEW APPROACH TO THE DESIGN OF FILTRATION SYSTEMS,
Loughborough Univ. of Technology (England). Dept. of Chemical Engineering.
D. C. Freshwater.
Filtration and Separation, Vol. 13, No. 3, p 242-248, May-June, 1976. 9 fig, 2 tab, 8 ref, 1 append.

Descriptors: *Waste water treatment, *Analytical techniques, *Treatment facilities, *Design, *Filtration, Suspended solids, Liquids, Optimization.

It is important, in designing solid-liquid separation processes, to consider the system as a whole and not simply the individual design and specifica-

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of the separate plant items. First the problem must be defined, including the nature of the feed, the changes that may occur during filtration, and the desired product quality. Then several alternative processing systems are chosen for consideration in detail. The alternatives are then assessed, beginning with calculating the material balance over the system. After the most appropriate system is chosen, it is optimized to produce the given throughput at a minimum cost. Allowance must be made for uncertainty, including variations in feed, environmental conditions, and throughput. Reliability theory may be used to assess the success probability of a given design. (Snyder-FIRL)
W76-12642

TURN SEWAGE INTO FUEL.
Canadian Chemical Processing, Vol. 60, No. 6, p 4, 6, June, 1976. 2 fig.

Descriptors: *Waste water treatment, *Sewage treatment, *Sewerage, *Biochemical oxygen demand, *Treatment facilities, *Fuels, Coals, Filters, Ions, Cadmium, Iron, Chromium, Manganese, Zinc, Copper.

A sewage treatment process under development produces a combined coal and sludge by-product that could be used as fuel. A filter bed of finely crushed coal is used to give a final biological oxygen demand of under 2 ppm and a 90% reduction in heavy metal ions. Effluent is charged from the upper part of the settling tank; suspended solids and additional pollutants settle to the bottom where they combine with coal particles for removal from the system. The supernatant liquid flows into a sump tank surrounding the settling tank. The filter bed absorbs cadmium, iron, chromium, manganese, zinc, and copper ions, along with wastes that induce biochemical oxygen demand (BOD) at between 0.5 and 0.6 gm/gm of coal. The treated water flows from the outer edge of the filter bed into another cylindrical tank where it is charged onto a sprinkling filter bed of coal to be treated further. A rake arm on the inclined lower part of the structure rakes out loaded coal particles in small portions from the lowest part of the filter bed. This sludge is then raked to the tank's center-well, where a bucket conveyor raises it to the upper part of the structure for disposal along with suspended solids and other wastes from the settling tank. One kg of coal sludge is generated for each cu m of waste water treated. It contains up to 60% water and can provide a minimum of 2,000 cal/gm when burned. The sludge could supply up to 15% of the required fuel for a power plant. Its heavy metal content would present no problem; it would be collected in the ash residue. (Snyder-FIRL)
W76-12643

EFFLUENT IRRIGATION OF RYE AND RYEGRASS,
Florida Univ., Gainesville. Dept. of Agricultural Engineering.
A. R. Overman, and H-C. Ku.
Journal of the Environmental Engineering Division, Proceedings of ASCE, Vol. 102, No. EE2, p 475-483, April, 1976. 4 fig, 6 tab, 12 ref, 2 append.

Descriptors: *Effluents, *Irrigation, *Soil types, Florida, *Forages, Weight, Harvesting, Rates of application, Soil moisture, Nutrients, Potassium, Absorption, Crop production, *Grasses, Water reuse, Recycling.
Identifiers: *Rye, *Ryegrass.

Rye and ryegrass grown on sandy soil in Florida were irrigated with secondary effluent. Forage was weighed after harvesting and samples were analyzed. Both responded well to irrigation with secondary municipal effluent. Dry matter yields showed a positive response to increased irrigation rates. Dry matter content decreased with irrigation, since soil moisture was more available to plants. Nutrient uptake generally increased and recovery efficiency declined with application rate. The effluent was deficient in potassium relative to other elements for production of rye or ryegrass. Potassium uptake exceeded applied potassium for most irrigation rates for both crops. Supplemental potassium might improve crop production with effluent irrigation. (Snyder-FIRL)
W76-12644

THE USE OF FLUID CATALYTIC CRACKING CATALYST IN ACTIVATED SLUDGE WASTE-WATER TREATMENT,
Exxon Research and Engineering Co., Linden, N.J. Corporate Research Labs.
R. D. Schwartz, and C. J. McCoy.
Journal Water Pollution Control Federation, Vol. 48, No. 2, p 274-280, February, 1976. 2 fig, 5 tab, 5 ref.

Descriptors: *Waste water treatment, *Sewage treatment, *Activated sludge, *Sewerage, *Catalysts, Activated carbon, Waste water(Pollution), Industrial wastes, Municipal wastes.
Identifiers: Refinery wastes.

Regenerated spent fluid catalytic cracking catalyst was assessed as an enhancer of conventional activated sludge water treatment systems and compared with activated carbon. Activated sludge and waste water were obtained from a refinery and a municipal sewage treatment plant. The sludge was allowed to settle for one hour, after which the supernatant was removed and replaced with waste water. The sludge-waste water mixture and either cracking catalyst or activated carbon were incubated at 30 C and shaken, after which the sludge settling rate and percentage settling by volume, and the percentage transmittance at 660 nm and total organic carbon (TOC) of the supernatant were measured. The catalyst increased the sludge settling rate, decreased the settled sludge volume and supernatant TOC, and increased supernatant clarity of a refinery activated sludge system as compared with conventional activated sludge treatment alone. It markedly reduced phosphate levels in a municipal sewerage activated sludge system. The catalyst may be acting like other aluminas and alumina-silicates, which absorb microorganisms and organic compounds. Results with refinery activated sludge were more promising than those with municipal sewerage activated sludge. Because of a dilute sludge and low initial TOC levels in the waste water, however, the municipal sewerage activated sludge may not have been a suitable test system. The observed effects may result from the support adsorbing contaminants directly, providing a surface on which the microbial population can adsorb, and promoting sludge settling and compaction by acting as a nucleation center for the bio-floc,
W76-12646

NITRIFYING ORGANISM CONCENTRATION AND ACTIVITY,
Union Carbide Corp., Tonawanda, N.Y.
E. G. Srinath, R. C. Loehr, and T. B. S. Prakasam.
Journal of the Environmental Engineering Division, Proceedings of ASCE, Vol. 102, No. EE2, p 449-463, April, 1976. 8 fig, 4 tab, 9 ref, 2 append.

Descriptors: *Waste water treatment, *Analytical techniques, *Microorganisms, *Nitrification, *Waste water(Pollution), Oxidation, Rates, Nitrites, Cultures.
Identifiers: *Mixed liquor.

A technique was developed to estimate the concentration of active nitrifying organisms in waste water mixed liquor. The oxidation rates for ammonium and nitrite in the mixed liquors were compared with those obtained with pure cultures of Nitrosomonas europaea and Nitrobacter agilis and N. winogradskyi suspended at known concentrations in a mineral salt medium containing their respective substrates. pH 7.4 to 7.9 was used as a reference to determine the rates, since this was the range where maximum rates occurred. The ratio of the specific oxidation rates of the nitrifying population of the mixed liquor and pure cultures under similar pH and temperature conditions represents the portion of the mixed liquor total Kjeldahl nitrogen (TKN) contributed by cellular TKN of autotrophic nitrifiers. This ratio yields the nitrifying organisms' TKN concentration when it is multiplied by the mixed liquor TKN concentration. The technique seems promising in aiding improved operation and design of nitrification processes and understanding the factors that affect these processes. The substrate concentrations did not affect the oxidation rates. The oxidation rates of nitrate and ammonium, at concentrations above 10 mg nitrogen/liter had zero-order kinetics. The pH influenced the oxidation rate. The pH optima were in the range of 7.4 to 7.9, and the concentration of nitrifying organisms in the system influenced the rate of oxidation. (Snyder-FIRL)
W76-12647

PRACTICAL ASPECTS OF ANAEROBIC DIGESTION,
Rowett Research Inst., Bucksburn (Scotland).
R. Summers, and S. Bousfield.
Process Biochemistry, Vol. 11, No. 5, p 3-6, June, 1976. 1 fig, 2 tab, 18 ref.

Descriptors: *Waste water treatment, *Sewage treatment, *Sewerage, *Treatment facilities, *Anaerobic digestion, Waste disposal, Energy, Organic wastes.
Identifiers: Energy production, Pollutional load.

The use of anaerobic digestion for waste disposal and energy production is discussed. Historically, the process has been used to reduce the pollutional load of strong, organic wastes of various kinds; recently the energy produced has become increasingly important. Anaerobic digesters are often used to treat domestic sewage. The gas produced may be used for heating needs at the digester site or for generating electricity. Some industrial wastes are suitable for anaerobic digestion, including slaughterhouse, fruit and vegetable, alcohol fermentation, and pulp and paper wastes. Because of their strength, an aerobic digester is often used to treat such wastes on-site before discharging them into a public sewer. Farm wastes are very amenable to anaerobic digestion. Two types of anaerobic digesters are used for farm wastes: the small, warm-climate Gobar gas unit and larger, heated digesters used in temperate climates. Pilot plant tests for the larger systems showed that digestion must be built up gradually. Operational problems include greater scum formation than in domestic digesters and the need for more stirring. Even during cold weather, an aerobic digester using farm waste can produce more energy in the form of gas than is needed to run them. (Snyder-FIRL)
W76-12648

A SURVEY OF PHOSPHORUS REMOVAL IN WISCONSIN,
Howard, Needles, Tammen and Bergendoff, Milwaukee, Wis.
D. A. Braasch, and E. F. Joeres.
Water Sewage and Works, Vol. 123, No. 7, p 70-73, July, 1976. 8 tab, 15 ref.

Descriptors: *Waste water treatment, *Phosphorus, *Surveys, *Wisconsin, *Regulation, Costs, Evaluation, Performance, Treatment, Legal aspects, Chemical wastes, Water pollution control, Pollution abatement.

Phosphorus removal data are presented for 50 plants in the state of Wisconsin affected by the state's phosphorus removal policy. As of August 1974, 17 plants were achieving phosphorus removals from the influent exceeding 85%. Out of 50 plants providing treatment for phosphorus

removal, less than half of the plants were attaining the required phosphorus reductions. Data are also presented on the types of phosphorus removal treatment being used by each plant; however the relative merits of alternative chemicals or treatment methods are impossible to evaluate because of local treatment problems and conditions. The major cost associated with phosphorus removal methods used in Wisconsin is the chemical cost. Treatment problems resulting in high chemical doses and the temporary nature of some chemical storage and feed facilities make the treatment costs difficult to interpret and evaluate. (Kreager-FIRL)
W76-12649

WASTE-TREATMENT SYSTEM CUTS ENERGY REQUIREMENTS.
Chemical Engineering, Vol. 83, No. 16, p 57-58, August 2, 1976.

Descriptors: *Biological treatment, *Oxidation, *Energy, *Biological membranes, *Waste water treatment, Suspended solids, Biochemical oxygen demand, Materials, Efficiencies, Costs, Filtration, Sewage treatment.
Identifiers: GaryGlas treatment system.

GaryGlas, a highly porous and rigid silica biological oxidation medium, is described as an economical alternative to more complex and more energy intensive aerated sludge treatment processes. Field tests on GaryGlas treatment systems varying in size from 40,000 to 2,100,000 gallons/day indicate that the medium does not require backwashing or forced aeration for the sustenance of the biological oxidation process. The material's intended use is as a secondary filter medium, although GaryGlas can also be used in tertiary polishing filters. Though priced about three times higher than competitive secondary treatment media, GaryGlas displays removal efficiencies that are 33-80% higher for both biochemical oxygen demand and total suspended solids. GaryGlas can be contained in vessels of concrete, fiberglass, or corrosion-proofed steel; the receptacle need offer only side support and wind resistance. (Kreager-FIRL)
W76-12650

U.S. ARMY MOBILITY EQUIPMENT RESEARCH AND DEVELOPMENT COMMAND ENVIRONMENTAL POLLUTION ABATEMENT PROGRAM,
R. P. Schmitt, and R. P. Carnahan.
Industrial Water Engineering, Vol. 13, No. 1, p 25-26, February/March, 1976.

Descriptors: *Waste water treatment, *Reclamation, Pollutant identification, *Model studies, *Programs, Federal government, Desalination, Sea water, Brackish water, Ozone, Ultraviolet radiation, Organic compounds, Industrial wastes, Land use, Economics, Analytical techniques, Polymers, Reverse osmosis.

The United States Army Mobility Equipment Research and Development Command's program in water and waste management is reviewed. The program includes the research and development of water supply systems for the production of potable water, systems for the storage and distribution of water, well drilling equipment, equipment for the collection and treatment of waste water designed for reuse and/or disposal, portable incinerators, and watercraft for waste treatment. Specific projects underway include: the development of reverse osmosis units for the desalination of brackish and sea water, studies of the destruction of bio-refractory organic compounds in water using ozonolysis catalyzed with ultraviolet light, the development of a carbon/polymer treatment process for reclaiming laundry waste water, the identification of trace organics in water, and the development of a land use modeling program aimed at determining the most economical and environmentally compatible use of land at military facilities. (Kreager-FIRL)
W76-12651

WASTEWATER RESOURCES IN NORTH CENTRAL TEXAS,
Camp, Dresser and McKee, Inc., Boston, Mass.
For primary bibliographic entry see Field 5G.
W76-12652

WATER-POLLUTION INSTRUMENTATION,
Weston (Roy F.), Inc., West Chester, Pa.
For primary bibliographic entry see Field 5A.
W76-12653

CONCENTRATIONS OF NITRIFYING BACTERIA IN SEWAGES, EFFLUENTS, AND A RECEIVING STREAM AND RESISTANCE OF THESE ORGANISMS TO CHLORINATION,
Rutgers - The State Univ., New Brunswick, N.J. Dept. of Environmental Science.
P. F. Strom, V. A. Matulewich, and M. S. Finstein.
Applied and Environmental Microbiology, Vol. 31, No. 5, p 731-737, May, 1976. 2 fig, 2 tab, 27 ref.

Descriptors: *Microbiology, *Bacteria, *Waste water(Pollution), *Waste water treatment, *Chlorination, Resistance, Effluents, Microorganisms, On-site investigations, Pollutant identification, Activated sludge, Sewage, Domestic wastes, *Nitrogen fixing bacteria.
Identifiers: *Nitrifying bacteria, Most probable number technique.

Estimates of nitrifying bacteria (NH4(+) and NO2(-) oxidizers) in samples from four activated sludge plants treating mainly domestic sewage were obtained using a most probable number technique. Concentration ranges per milliliter were 1010-3880 and 79-145 in settled sewages, 32-7420 and 2-1010 in secondary effluents, and from less than 0.1 to 622 and 0.1-70 in chlorinated secondary effluents. These results indicated that nitrifiers are more resistant to chlorination than fecal streptococci. Laboratory studies with these nitrifying bacteria involving chlorine exposures of up to 2 milligrams/liter for 0-60 minutes also indicated that nitrifiers are more resistant than fecal streptococci to chlorination, with the NO2(-) oxidizers showing the greatest resistance. Below the outfall of a sewage plant that discharges heavily chlorinated unnitrified effluent, NH4(+) oxidizers amounted to approximately 20 million/gram of slime scraped from stream-bed rocks. The figure upstream of the outfall was about 300,000/gram. (Kreager-FIRL)
W76-12654

PHYSICOCHEMICAL WASTEWATER TREATMENT METHODS, (IN GREEK),
M. A. Delichatsios.
Texnika Xponika, Vol. 44, No. 5, p 227-230, 1975. 3 fig, 9 ref.

Descriptors: *Waste water treatment, *Biological treatment, *Treatment facilities, *Coagulation, *Adsorption, *Sedimentation, Suspended solids, Organic matter.
Identifiers: *Physico-chemical treatment.

Physico-chemical methods of waste water treatment use coagulation and sedimentation to remove suspended solids, and carbon adsorption columns to remove organic matter. Compared with biological treatment methods, these methods operate reliably for varying qualities of waste water and have improved economy and efficiency. The basic laws in such a system with respect to the phenomena of coagulation, breakup and sedimentation of the suspended solids in turbulent flows have been developed. Knowledge of these laws leads to intelligent design of systems for waste water treatment. A new system using coagulation in turbulent pipe flows was proposed with the advantage of substantially reduced space requirements compared with traditional system (Snyder-FIRL)
W76-12655

A CONTRIBUTION TO STABILIZATIO PONDS DESIGN, (IN GREEK),
P. S. Kollias.
Texnika Xponika, Vol 44, No 5, p 219-225, 1975 fig, 5 ref.

Descriptors: *Waste water treatment, *Sewa treatment, *Biological treatment, *Sewera *Oxidation lagoons, *Treatment faciliti Biochemical oxygen demand, *Design criteria.

Stabilization ponds are shallow basins treating ganic wastes, especially sewage, by storing under conditions favoring natural biological tre ment. Stabilization ponds may be used alone following preliminary treatment. The proces occurring simultaneously include sedimentat and bioflocculation, aerobic bacterial oxidati and photosynthesis. Applications of these po and their classification, performance, and des criteria are discussed. An empirical equation w a rational basis for the volume of stabilizatio given. Experimental ponds and biochemical ygen demand (BOD) efficiency are discussed the method of design is described analytically sample system serving a population of 4500 inh tants near Mer a Aude is described. (Snyd FIRL)
W76-12656

ANTHRACITE ACTIVATED CARBONS: MA FACTURE AND APPLICATIONS,
J. S. Batchelor.
Filtration and Separation, Vol 13, No 3, p 3 May-June, 1976. 7 ref.

Descriptors: *Waste water treatment, *Co *Activated carbon, *Industrial product *Adsorption, Quality control, Potable water, fluents, Detergents, Pesticide removal, Liqu Gases.
Identifiers: Dechlorination.

Anthrasorb activated carbons are manufactu from anthracite. The manufacturing proc characterization, quality control, and techn services are described. The largest markets liquid phase adsorption are the sugar industry water and effluent treatment. Activated carb are important in treating both potable water effluents. One grade of Anthrasorb is extensi used to dechlorinate water on ships and oil Granular Anthrasorb is widely used for effl treatment applications as diverse as removal of tergents from vehicle washing plant waters removal of biocides from effluents at a pesti plant. Other liquid and vapor phase applicat are also discussed. (Snyder-FIRL)
W76-12658

A FRESH APPROACH TO MICROSTRAININ
D. L. B. Arnold.
Filtration and Separation, Vol 13, No 3, p 272- May-June, 1976. 8 fig, 1 tab.

Descriptors: *Waste water treatment, *Sew treatment, *Sewerage, *Filters, *Filtrat Fabrics, Suspended solids, Efficiencies, Po Size.
Identifiers: *Microstraining.

In microstraining, water is strained under a differential head through a fine woven fabric rotating drum. The suspended matter retaine the mesh contributes to straining efficiency b fectively reducing the size of the pores in fabric. Microstrainer design is discussed, inclu construction, fabric panels, backwashing, dri system, hydraulics, structure and housing. F fabrics are usually made of stainless steel

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where the possibility of corrosion exists, plastic. The aperture,size is usually between 20 and 40 microns. The removal efficiency is determined by the mechanics of mat formation. Microstraining is used for water supply after treatment as well as for tertiary treatment of biologically purified sewage, generally after sedimentation. The Filtester, a small, inexpensive device, can be used to determine the capacity of a microstrainer. It filters a sample of the water to be treated through a piece of clean microfabric, determining the volume of water filtered in a time interval corresponding to the submersion time of an element of microfabric in normal microstrainer operation. (Snyder-FIRL)
W76-12659

RECOVERY OF P205 FROM WASTE-WATERS BY ADDING LIME (SEKKAI SHORI NI YORU HAISUICHU NO P2O5 NO KAISHU),
M. Mori.
Kekko to Sekkai, (Gypsum and Lime), No 142, p 111-113, May, 1976. 3 fig, 2 tab, 4 ref.

Descriptors: *Waste water treatment, *Phosphorus compounds, *Waste water(Pollution), *Lime, *Chemical wastes, Laboratory tests, Chemical analysis, *Chemical precipitation, Fluorine, Crystals, Solubility.
Identifiers: *Phosphorus pentoxide recovery.

Adding lime to recover phosphorus pentoxide in waste water from wet process phosphoric acid plants was studied by means of laboratory tests. The products were also analyzed. Prior to phosphorus pentoxide precipitation, most of the fluorine was precipitated as calcium fluoride at pH 3 to pH 4; the remainder of the phosphoric acid was then precipitated as fine apatite crystals. The size of the apatite crystals varied with the amount of fluorine in the waste water. Although citrate solubility varied with the crystal size, all of the apatite was entirely soluble in a 2% solution of citric acid. (Snyder-FIRL)
W76-12660

FLOTATION: TWO FRESH WAYS TO TREAT EFFLUENTS,
Imperial Chemical Industries, Ltd., London (England).
D. B. Chambers, and W. R. T. Cottrell.
Chemical Engineering, Vol 83, No 16, p 95-98, August 2, 1976. 2 fig, 5 tab.

Descriptors: *Waste water treatment, *Flotation, *Bubbles, *Electrolysis, Industrial wastes, Suspended solids, Lipids, Biochemical oxygen demand, Oil wastes, Efficiencies, Sludge treatment, Flocculation.
Identifiers: *Microflotation, *Electroflotation.

The treatment of waste water with electroflotation and microflotation techniques is discussed. Electroflotation, which involves the generation of bubbles by electrolysis, is especially recommended for low flow rates (less than 25 cu m/hr). Data compiled from 20 electroflotation units that treat industrial effluents in the United Kingdom indicate that electroflotation is a practical, first-stage treatment for reducing suspended solids, fats, and biochemical oxygen demand as well as for sludge thickening. Microflotation, which is a dissolved-air flotation technique, combines the benefits of advanced chemical flocculation with a novel and simple method for generating air bubbles which leads to the removal of solids, fats, and oils by flotation. In addition to its simplicity and ease of operation, microflotation requires little space. Large interfering air bubbles are absent, and solids removal is usually in excess of 99%. About 19 full-scale plants are operating in Sweden, and others are under construction in Finland, Norway, the United Kingdom, and Japan. (Kreager-FIRL)
W76-12661

RECENT DEVELOPMENTS IN SEWAGE TREATMENT AND EQUIPMENT,
G. E. Thompson, and G. J. Maguet.
Water and Pollution Control, Vol 114, No 7, p 28, 30-33, July, 1976. 5 fig, 9 ref.

Descriptors: *Waste water treatment, *Sewage treatment, *Biological treatment, Physical control, *Activated sludge, *Disinfection, Trickling filters, Lime, Iron compounds, Chlorides, Nitrification, Denitrification, Ozone, Radiation, Efficiencies, Equipment, Performance, Gamma rays, *Canada.
Identifiers: Rotating discs, Alum, Ferric chloride, Physico-chemical treatment, Bromination.

Improvements in sewage treatment methods and equipment are reviewed. Improved tank designs for primary clarification have resulted in increased organics removal and virtual elimination of short circuiting. The use of pure oxygen instead of air in biological treatment schemes is a process improvement which is typified by low retention times, excellent removal efficiencies, and excellent sludge characteristics. The use of deep tanks (up to 22 ft) in activated sludge processes has resulted in transfer efficiencies up to 100% greater than those previously achieved with virtually identical aeration equipment. The rotating biological contactor, which is a modification of the trickling filter process, is typified by extremely low power requirements and excellent reaction to shocking. Physico-chemical treatment processes involving waste water treatment with chemicals such as lime, alum, and ferric chloride are compact and provide high-grade treatment. The introduction of the nitrification-denitrification step into the treatment of waste water for nutrient removal represents a new process addition to the sewage treatment plant. Other new treatment processes in the field of disinfection include: ozonation, bromination, and gamma radiation. (Kreager-FIRL)
W76-12662

DIGESTION OF AQUEOUS WASTES WITH OXYGEN PRESSURE-RECYCLING OXIDATION SEWAGE TREATMENT,
Polytechnic Inst. of New York, Brooklyn. Dept. of Chemical Engineering.
D. F. Othmer.
Process Biochemistry, Vol 11, No 5, p 8-10, 17, June, 1976. 1 fig, 5 ref.

Descriptors: *Waste water treatment, *Sewage treatment, *Sewerage, *Treatment facilities, *Digestion, Waste water(Pollution), Liquid wastes, Oxygen, High pressure, Recycling, Oxidation.

Oxidation of wastes is due to strictly chemical action, enzymatic action, and biochemical action. Both biochemical and enzymatic influences on oxidation are lost at temperatures much above the ambient, but the chemical action is substantially increased at high temperatures and pressures. A number of considerations favor the use of oxygen or oxygen-enriched air in the aerobic digestion of sewage waters. In the best known system using oxygen at atmospheric pressures, several covered conventional aerated digestor tanks are connected for liquid flow and for gas flow in the space above the liquid. Several sewage treatment systems have been used which use increased pressure to dissolve oxygen from air more rapidly. In an improved method using higher pressures, the pressurized waste waters are depressurized after using the oxygen dissolved in them, releasing other dissolved gases. More oxygen is then dissolved by pressurizing the waste waters again with air or oxygen. In one system that can be used for this pressure-recycling oxidation sewage treatment, the aerated influent sewage enters the inner cylinder which also acts as a digester for the organics. The liquid overflows the top of the inner cylinder, and, in the space outside the cone, flocculation and settling of solids and clarification of the liquid take place. This system may act as a complete sewage treatment plant, especially in small sizes. It may also be incorporated with other conventional equipment and processing in larger industrial or municipal plants. (Snyder-FIRL)
W76-12663

BULKING CONTROL MADE EASY - WITH HYDROGEN PEROXIDE,
FMC Corp., Princeton, N.J.
W. G. Strunk, and J. Shapiro.
Water and Pollution Control, Vol 114, No 7, p 10, 12, 14, 15, 40-41, July, 1976.

Descriptors: Analytical techniques, *Activated sludge, *Microenvironment, *Microscopy, *Microbiology, Bacteria, Protozoa, Microorganisms, *Waste treatment, Oxidation.
Identifiers: *Hydrogen peroxide, *Sludge bulking control.

A visual means for predicting potential bulking situations with activated sludge systems and for pinpointing the time at which hydrogen peroxide treatment should begin is described. Sludge bulking involves failure of the sludge to settle adequately, with suspended solids passing out with the effluent. This is most frequently caused by the growth of filamentous bacteria which are susceptible to oxidative attack by hydrogen peroxide. When bulking is imminent, changes occur in the animal and bacterial life in the sludge that can be observed by microscope. Filamentous bacteria can be seen at 100 power magnification when bulking is imminent but are rare in a sludge which compacts and settles readily. Protozoa are also easily observed at 100 power magnification and are the best index of the health of activated sludge. Microscopic observations of four distinct stages of microbiological activity as sludge goes from a healthy state, through incipient bulking, to full bulking, and back to the healthy state are described. Corrective action with hydrogen peroxide is recommended as soon as the initial growth of filamentous bacteria is observed. (Kreager-FIRL)
W76-12664

THE OPERATION OF A SIMPLEX ACTIVATED SLUDGE PILOT PLANT IN AN ATMOSPHERE OF PURE OXYGEN, PART 2,
L. B. Wood, R. P. King, M. K. Durkin, H. J. Finch, and D. Sheldon.
The Public Health Engineer, Vol 4, No 3, p 67-75, May, 1976. 13 fig, 3 tab, 20 ref.

Descriptors: *Waste water treatment, *Activated sludge, *Pilot plants, *Oxygen, *Atmosphere, Air, Oxidation, Ammonia, *Treatment facilities.

Discussion is continued of a study of the use of oxygen to replace air in the activated sludge process, particularly with respect to more rapid oxidation of the carbonaceous substrate, more rapid oxidation of ammonia, and the production of smaller quantities of activated sludge with better settling characteristics and higher solids content. There was no evidence of a higher rate of carbonaceous substrate removal on a kinetic basis. Nevertheless, high dissolved oxygen concentrations are attainable, and higher mixed liquor solids can be maintained at higher plant loadings. The maximum growth rate of Nitrosomonas can be reduced in single-stage systems by low pH in mixed liquor where the latter is enclosed with oxygen, and carbon dioxide is allowed to build up in the gas space. No acclimatization to low pH is apparent. There is no reduction in the quantity of sludge produced. The growth rate associated with organisms oxidizing carbonaceous substrate is similar to that with air-based sludge yield. There was no evidence of increased sludge removal by endogenation and lysis. No special advantage was revealed by the settlement of the sludge as measured by the standard procedure and used for calculation of linear settlement rate. High sludge density indices apparently did not develop. (See also W76-09669) (Snyder-FIRL)
W76-12665

ESTIMATING THE RELIABILITY OF ADVANCED WASTE TREATMENT - PART 2,
Southwest Ohio Regional Computer Center, Cincinnati.
R. B. Dean, and S. L. Forsythe.
Water Sewage and Works, Vol. 123, No. 7, p 57-60, July, 1976. 7 fig, 2 tab, 18 ref.

Descriptors: *Tertiary treatment, *Statistical methods, *Reliability, *Treatment facilities, *Estimating, Biochemical oxygen demand, Chemical oxygen, Turbidity, Coliforms, Chlorine, Data collection, *Waste water treatment.

Statistical estimates of the long-term reliability of advanced waste treatment plants are discussed based on daily operating data covering six years of continuous operation at a waste treatment plant plus shorter records from other plants. Topics discussed include: artifacts produced by the logarithmic conversion of data, errors resulting from confusing the median with the mean when reporting data, and the probability of exceeding any finite upper limit when the performance of a plant obeys normal or lognormal statistics. The decision as to how specifications should be set is seen as being based on the effects of violations and, ultimately, on the internal cost of compliance in comparison with the external cost of violation. Examples of logarithmic plots of data are illustrated for biochemical oxygen demand, chemical oxygen demand, turbidity, coliform count, and residual chlorine. (Kreager-FIRL)
W76-12666

OPTIMIZE THE EFFLUENT SYSTEM - PART 4: APPROACH TO CHEMICAL TREATMENT,
Standard Oil Co., Chicago, Ill.
J. F. Grutsch, and R. C. Mallatt.
Hydrocarbon Processing, Vol. 55, No. 6, p 115-123, June, 1976. 18 fig, 4 tab.

Descriptors: *Oil industry, *Waste water treatment, *Colloids, *Suspended solids, *Optimization, Silica, Electrolytes, Analytical techniques, Ions, Neutralization, Chemical reactions, Sulfides, Salinity, Lagoons, Aeration.
Identifiers: *Chemical treatment.

Methods for optimizing the treatment of petroleum refinery effluents are discussed. Examples and case histories are presented for the following four collidal systems: dispersed silica, suspended matter in API separator effluent, biocolloids in fresh water aerated lagoon effluent and biocolloids in brackish water aerated lagoon effluent. Specific topics covered include: the response of colloidally dispersed silica to destabilization chemicals and an indifferent electrolyte; the comparative effectiveness of cationic polyelectrolytes for the charge neutralization of suspended matter in API separator effluents as determined by zeta potential titration curves; polyelectrolyte synergisms and antagonisms in salinity, pH, and sulfides in API separator effluents; the comparative effectiveness of cationic polyelectrolytes for the charge neutralization of biocolloids in aerated lago on effluent; and the determination of optimal chemical treatment for biocolloids in brackish waters using zeta potential measurements at low specific conductance to insure that charge neutralization is the predominant destabilization mechanism. (Kreager-FIRL)
W76-12667

OXYGEN ACTIVATED-SLUDGF SYSTEMS--I., TECHNICAL REVIEW OF THF USE OF OXYGEN IN THE TREATMENT OF WASTE WATER,
Water Pollution Research Lab., Stevenage (England).
A. G. Boon.
Water Pollution Control, Vol. 75, No. 2, p 206-213, 1976. 1 fig, 2 tab, 34 ref.

Descriptors: *Oxygen, *Sewers, *Activated sludge, *Waste water treatment, *Aerobic treatment, Biological treatment, Treatment facilities, Water quality control, Rivers, Treatment, Evaluation, Biochemical oxygen demand, Sludge, Lagoons, Nitrification.

Advantages and disadvantages associated with the use of oxygen in waste water treatment applications involving activated sludge processes, river protection, and the maintenance of aerobic conditions in rising-main sewers are discussed. Waste waters containing high biochemical oxygen demand concentrations (greater than 1000 mg/liter) can be treated very economically with oxygen activated sludge processes. Moreover, the settleability of sludge from oxygenated plants is better than that of sludge from air activated sludge plants, and the volume of surplus sludge is lower with oxygen processes. The injection of oxygen to maintain aerobic conditions in rising-main sewers is in some cases economically more advantageous than the use of air injection. Oxygen can be used to increase the oxygenation capacity of treatment plants, rivers, or lagoons in emergency situations at a lower cost than that associatd with aeration systems. Disadvantages connected with the use of oxygen include: increased complexity, increased energy consumption, difficulties associated with achieving nitrification in oxygenated activated sludge plants, and the hazards connected with storing and using oxygen. (Kreager-FIRL)
W76-12668

UK WORK ON THE USE OF OXYGEN IN THE TREATMENT OF WASTE WATER, ASSOCIATED WITH THE CCMS ADVANCED WASTE WATER TREATMENT PROJECT, (II).
Department of the Environment, London (England). Directorate General Water Engineering.
N. Banks.
Water Pollution Control, Vol. 75, No. 2, p 214-220, 1976. 8 tab, 3 ref.

Descriptors: *Activated sludge, *Oxygen, *Oxidation, *Sewage treatment, Pilot plants, On-site investigations, Biological treatment, Treatment facilities, Sludge, Nitrification, Treatment, Evaluation, Performance, *Waste water treatment.
Identifiers: United Kingdom, Settling characteristics.

Pilot plant studies dealing with the use of oxygen activated sludge treatment of waste water are reported for a number of sewage treatment facilities throughout the United Kingdom. Oxygen plants appear to be capable of carbonaceous removal at rates higher than those of air plants of comparable size, thus offering land use and cost advantages. Oxygen plants also appear to produce reduced amounts of surplus sludge, and oxygen-produced sludge possesses better settling characteristics than does air-produced sludge. Nitrification is inhibited in enclosed oxygen reactors; however, the resultant effluents can be successfully nitrified in a second stage using air. (Kreager-FIRL)
W76-12669

DEVELOPMENT IN THE APPLICATION OF OXYGEN IN THE ACTIVATED-SLUDGE PROCESS IN THE FEDERAL REPUBLIC OF GERMANY, (III).
Technische Universitaet, Munich (West Germany).
W. Hegemann, and W. Bischofsberger.
Water Pollution Control, Vol. 75, No. 2, p 221-226, 1976. 2 fig, 4 tab, 10 ref.

Descriptors: *Activated sludge, *Oxygen, *Oxidation, *Waste treatment, Sludge, Domestic wastes, Industrial wastes, Treatment facilities, Biomass, Physical properties, Evaluation, On-site investigations, Performance.
Identifiers: Sludge volume index, Settling characteristics, Oxygen activated sludge.

The treatment of domestic and industrial waste with an oxygen activated sludge process was investigated at a number of waste treatment plant throughout West Germany. Retention periods in oxygenation tanks were shorter due to higher decay rates with oxygen activated sludge operation. Lower biomass loadings were also observed for a given tank size, implying that smaller tank volumes are possible with the oxygen activated sludge process. Specific surplus sludge production was reduced with the oxygen process, with solid production amounting to only about 50% of that associated with conventional air plants. The settleability of most oxygen sludges, as indicated by the sludge volume index, was better than that of air sludges. The oxygen process appeared to be inadequate, however, in applications where nitrification was required. (Kreager-FIRL)
W76-12670

LAGOONS AND OXIDATION PONDS, (LITERATURE REVIEW),
Black and Veatch, Kansas City, Mo.
W. J. O'Brien.
Journal Water Pollution Control Federation, Vol. 48, No. 6, p 1107-1110, June, 1976. 38 ref.

Descriptors: *Oxidation lagoons, *Lagoons, *Ponds, *Biological treatment, *Waste treatment, Aeration, Mixing, Industrial wastes, Design criteria, Mathematical models, Biochemical oxygen demand, Cost-benefit analysis, Heat transfer, Zooplankton, *Reviews, *Bibliographies.
Identifiers: *Literature reviews.

A literature review of paper concerning lagoons and oxidation ponds is presented. Specific subjects covered include: mixing and heat exchange in aerated lagoons, the treatment of cheese processing wastes in a two-cell aerated lagoon, design procedures for ring-shaped ponds, mathematical equations for describing the operation of aerated and facultative lagoons connected in series, comparisons of the soluble organic carbon removal in conventional single-cell anaerobic ponds and in baffled ponds, a procedure for calculating the surface area of a facultative lagoon required to obtain a desired biochemical oxygen demand reduction, an analysis of the most cost effective treatment system for upgrading the effluent from oxidation ponds, the use of isolated periodic fill and draw final basins for upgrading the effluent from conventional facultative ponds, and structural configurations that facilitate zooplankton growth in oxidation ponds. (Kreager-FIRL)
W76-12671

ANAEROBIC PROCESSES, (LITERATURE REVIEW),
Institute of Gas Technology, Chicago, Ill.
S. Ghosh, J. R. Conrad, M. Packer, and E. Van Ryzin.
Journal Water Pollution Control Federation, Vol. 48, No. 6, p 1115-1137, June, 1976. 120 ref.

Descriptors: *Anaerobic conditions, *Biological treatment, *Anaerobic digestion, *Anaerobic bacteria, *Waste water treatment, Reclamation, Microbiology, Denitrification, Bicarbonates, Methane, Fermentation, Carbon, Toxicity, Industrial wastes, Kinetics, Bacteria, Pseudomonas, *Reviews, *Bibliographies.
Identifiers: *Literature reviews.

A literature review of methods which utilize anaerobic processes is presented, with particular emphasis on waste water treatment. General topics covered include: microbiological aspects, mechanistic studies, anaerobic denitrification studies, and process applications. Specific subjects discussed under the above general headings include: the isolation and identification of methanogenic bacteria, the use of labeled bicarbonate to determine the rate of bacterial methane formation, the efficiency of denitrification

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Pseudomonas denitrificans grown in glutamate-limited batch and continuous cultures, the effect of cell residence time on the kinetics and stoichiometry of bacterial denitrification, methods for removing nitrogen from primary waste water in biological reactors without the use of supplemental organic carbon, the effect of toxic industrial wastes and retention times on loading and methane production in waste water digesters, the use of anaerobic acid-phase fermentation to precondition swine manure for subsequent aerobic stabilization, and the use of anaerobic processes for energy reclamation (methane production). (Kreager-FIRL)
W76-12673

BIOLOGICAL FILTERS, (LITERATURE REVIEW),
National Environmental Research Center, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
R. L. Bunch.
Journal Water Pollution Control Federation, Vol. 48, No. 6, p 1096-1098, June, 1976. 19 ref.

Descriptors: *Biological treatment, *Waste water treatment, *Trickling filters, *Filtration, Model studies, Performance, Costs, Industrial wastes, Bacteria, Patents, Kinetics, Equipment, Ammonia, Nitrogen, *Reviews, *Bibliographies.
Identifiers: *Literature reviews.

A review of literature dealing with biological filtration of waste water is presented, with particular emphasis on trickling filters and rotating biological contactors. Topics covered include: models for studying the performance of trickling filters, studies on the cost of trickling filter recirculation, the use of trickling filters containing a plastic medium for treating waste water from edible oil plants, studies of the growth kinetics of heterotrophic bacteria on plastic medium trickling filters, the ammonia nitrogen removal characteristics of rotating biological contactors, and patents for various waste water treatment systems employing rotating biological contactors. (Kreager-FIRL)
W76-12674

ACTIVATED SLUDGE, (LITERATURE REVIEW),
California Univ., Davis. Dept. of Civil Engineering.
E. D. Schroeder.
Journal Water Pollution Control Federation, Vol. 48, No. 6, p 1098-1107, June, 1976. 110 ref.

Descriptors: *Activated sludge, *Waste water treatment, *Sludge treatment, *Treatment facilities, Economics, Flocculation, Nitrification, Denitrification, Phosphorus, Chemical precipitation, Anaerobic conditions, Kinetics, Oxygen, Separation techniques, Design criteria, Model studies, Aeration, Nitrogen, *Reviews, *Bibliographies.
Identifiers: *Literature reviews.

A review of literature dealing with activated sludge processes is presented. Topics covered include: a two-state microbial growth model for explaining flocculation and deflocculation processes and varying cell yields, the modeling of contact stabilization processes, dynamic process control of activated sludge and nitrification processes using activated sludge, and the relationship of trace metal deficiencies to filamentous growths in activated sludge. Design criteria for activated sludge waste water treatment plants are presented, as well as an analysis of oxygen uptake rates in reacting and nonreacting systems, studies of deep tank aeration, processes available for nitrogen removal, the construction of a nominal plug flow nitrification process, pilot plant nitrification-denitrification studies in Sweden, the involvement of luxury uptake and cationic precipitation in phosphorus removal, phosphorus release during the anaerobic treatment of sludge, the application of a centrifugal screen for removing solids in activated sludge processes, and current trends and costs for package waste water treatment systems. (Kreager-FIRL)
W76-12675

5E. Ultimate Disposal Of Wastes

DISPOSAL ALTERNATIVES FOR INTERMITTENT SAND FILTER SCRAPINGS UTILIZATION AND SAND RECOVERY,
Utah Center for Water Resources Research, Logan.
For primary bibliographic entry see Field 5D.
W76-12219

CONTAMINANT EFFECTS ON BIOTA OF THE NEW YORK BIGHT,
State University of New York at Stony Brook. MESA New York Bight Project
For primary bibliographic entry see Field 5C.
W76-12229

DETERMINATION OF THE CONDITIONS OF DISCHARGE OF SEWAGE INTO WATERS, (IN RUSSIAN),
Ministerstvo Zdravookhraneniya SSSR, Moscow. Institut Biofiziki.
For primary bibliographic entry see Field 5G.
W76-12266

ROLE OF AGRICULTURE IN THE QUALITY OF THE NEW HAMPSHIRE ENVIRONMENT,
New Hampshire Univ., Durham. Inst. of Natural and Environmental Resources.
For primary bibliographic entry see Field 5G.
W76-12337

LOW-COST DISPOSAL SYSTEMS FOR FEEDLOT RUNOFF,
Agricultural Research Service, Lincoln, Nebr.
For primary bibliographic entry see Field 5G.
W76-12346

SECOND NATIONAL SYMPOSIUM ON POULTRY INDUSTRY WASTE MANAGEMENT.
For primary bibliographic entry see Field 5D.
W76-12347

SURMOUNTING THE POULTRY WASTE PROBLEM,
Cornell Univ., Ithaca, N. Y. Dept. of Poultry Science.
For primary bibliographic entry see Field 5D.
W76-12348

MAINE GUIDELINES FOR MANURE AND MANURE SLUDGE DISPOSAL ON LAND.
Maine Univ., Orono. Cooperative Extension Service.
For primary bibliographic entry see Field 5G.
W76-12353

ECONOMIC EVALUATION OF LIQUID MANURE DISPOSAL SYSTEMS FOR DAIRY CATTLE,
Economic Research Service, Madison, Wis. Farm Production Economics Div.
For primary bibliographic entry see Field 5G.
W76-12357

WATER QUALITY AND WASTE DISPOSAL IN MONTANA,
Montana State Univ., Bozeman. Dept. of Botany and Microbiology.
For primary bibliographic entry see Field 5C.
W76-12359

YOU HAVE TO 'THINK MAINTENANCE' IN MANAGING FEEDLOT RUNOFF SYSTEMS,
For primary bibliographic entry see Field 5D.
W76-12360

WLJ PREVIEWS FIRST COMMERCIAL MANURE SYSTEM,
For primary bibliographic entry see Field 5D.
W76-12361

ANIMAL WASTE AND NITRATE MOVEMENT THROUGH SOIL,
Connecticut Univ., Storrs. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W76-12362

MANAGEMENT OF RUNOFF WATER IN RELATION TO FEEDLOT OPERATIONS,
Soil Conservation Service, Temple, Tex.
For primary bibliographic entry see Field 5D.
W76-12365

SOIL CONSERVATION SERVICE STANDARD AND SPECIFICATIONS FOR POLLUTION ABATEMENT MEASURES FOR CONFINED LIVESTOCK OR POULTRY FEEDING OPERATIONS,
Soil Conservation Service, Temple, Tex.
For primary bibliographic entry see Field 5G.
W76-12367

OUTLOOKS FOR THE FUTURE OF DEEP WELL DISPOSAL,
SCS Engineers, Reston, Va.
E. T. Conrad, and N. E. Hopson.
Water Resources Bulletin, Vol 11, No 2, p 370-378, April 1975. 1 fig, 4 tab, 6 ref.

Descriptors: Wells, *Waste disposal, *Waste disposal wells, Wastes, Groundwater, *Deep wells, *Water quality standards, Water pollution control, Waste water disposal.

A rationale is presented for estimating the quantities of industrial waste that may be disposed of by deep well injection. Deep well injection refers to disposal to a saline aquifer (not a potable water supply) and does not include injection of oil field brine. Literature discussing regulation and curtailment of deep well injection of industrial wastes presents the argument that little is known about this method. Industrial wastes have been disposed of by deep well injection for less than 20 years and there are only 216 such wells in the United States, of which only 162 are currently operating. However, related experience has been gained from disposal of oil field brine by injection. There are more than 40,000 deep wells now being utilized for this purpose. The various issues are discussed in relation to the Federal Water Pollution Control Act of 1972; and estimates based on increased use of deep well injection by major industries are projected. (Skogerboe-Colorado State)
W76-12370

EVALUATION OF SOLID WASTE BALING AND BALEFILLS. VOLUME I,
Ralph Stone and Co., Inc., Los Angeles, Calif.
For primary bibliographic entry see Field 5A.
W76-12381

ALUM RECOVERY AND WASTE DISPOSAL IN WATER TREATMENT,
Metcalf and Eddy, Inc., New York. (Assignee).
For primary bibliographic entry see Field 5F.
W76-12399

CONTROLLING SURFACE WATER CONTAMINATION AT THE ESSO REFINERY AT

ANTWERP (DE BESTRIJDING VAN DE VERONTREINIGING VAN HET OPPERVLAKTEWATER IN DE ESSO-RAFFINADERIJ TE ANTWERPEN),
For primary bibliographic entry see Field 5D.
W76-12416

RECENT DEVELOPMENTS IN TANNERY EFFLUENT DISPOSAL,
Rhodes Univ., Grahamstown (South Africa). Leather Industries Research Inst.
For primary bibliographic entry see Field 5D.
W76-12425

EVALUATION OF PROPOSED SEWAGE SLUDGE DUMPSITE AREAS IN THE NEW YORK BIGHT.
National Oceanic and Atmospheric Administration, Boulder, Colo. Marine Ecosystems Analysis Program Office.
Technical memorandum NOAA TM ERL MESA-11, February 1976. 212 p, 103 fig, 22 tab, ref, append.

Descriptors: *Soil disposal fields, *Sewage sludge, *Sludge disposal, Environmental engineering, Ecosystems, Water pollution, Waste disposal.
Identifiers: *Dumpsites, *Disposal procedure, *Sea bed, Coastal waters, Water columns, *New York Bight.

Presented are summaries of significant features of the New York Bight's midshelf environment and alternative sewage sludge dumpsite areas 1-A and 2-A, conclusions about the effects of dumping sewage sludge at any interim dumpsite in this environment, and specific recommendations relative to dumping operations and monitoring activities. (NOAA)
W76-12469

ULTIMATE DISPOSAL OF BIOLOGICAL SLUDGES -- A NOVEL CONCEPT,
B.C. Research, Vancouver.
E. G.-H Lee, J. C. Mueller, and C. C. Walden.
Pulp and Paper Canada, Vol. 77, No. 6 p 88-90, 92-95 (T104-110), June, 1976. 8 fig, 17 ref, 4 tab.

Descriptors: *Sludge disposal, *Activated sludge, *Pulp wastes, Biological treatment, Oxidation, Hydrolysis, Recycling, Effluents, Costs, Estimated costs, Wastes, Industrial wastes, Waste treatment, Water pollution sources, Water pollution treatment, Suspended solids, Sludge, Solid wastes, Sodium compounds, *Ultimate disposal.
Identifiers: Kraft mills, Sodium hydroxide.

The disposal of sludges from activated sludge systems involves digestion in 0.1 N NaOH for 2 hr at 50-70 C, recycling the hydrolyzate to the biosystem, and complete biological oxidation to carbon dioxide and water. Results of tests with kraft mill effluents indicate that the process reduces approximately 5-fold the amount of sludge requiring ultimate disposal. Treatment costs are estimated at $1.81/air-dry ton of pulp. Additional benefits of this process include improvement of sludge settleability and low suspended solids in clarified effluents. (Sykes-IPC)
W76-12481

THE DISPOSAL OF WASTES INTO THE SEA OF THE PROVINCE OF ROME (ITALY), (IN ITALIAN),
P. Zucchetti, M. Floccia, and G. Palmieri.
Ann Sclavo. 16(4), p 393-412, 1974.

Descriptors: *Waste disposal, Coasts, *Public health, *Water quality, *Waste treatment, *Organic wastes.
Identifiers: Rome Province(Italy).

The most important causes of the continuous increase of the amount of refuse and the negative consequences of this waste on human health and on the quality of the environment are reviewed. Modern technical advances in methods of waste treatment and disposal of organic wastes in the sea are discussed. The methods presently used in the urban coastal centers of the province of Rome for waste treatment and marine disposal are covered.--Copyright 1975, Biological Abstracts, Inc.
W76-12570

DEVELOPMENT OF RESIDUALS MANAGEMENT STRATEGIES,
Indiana Univ., Bloomington. School of Public and Environmental Affairs.
For primary bibliographic entry see Field 5G.
W76-12581

COLESHILL (2): INCINERATING SEWAGE SLUDGE,
Water, No. 8, p 23-24, May, 1976. 1 fig.

Descriptors: *Sludge treatment, *Sludge disposal, *Incineration, *Dewatering, *Treatment facilities, Waste treatment, Equipment, Sewage sludge, Sewage treatment.
Identifiers: United Kingdom.

A description of the Severn Trent Water Authority's sewage sludge incineration plant at Coleshill, England is provided. The plant handles sludge from sewage treatment plants in the area which amounts to about 3500 cu m/day. The sludges which contain about 95% water are initially passed through mechanically raked screens for removal of gross solids and are then directed to storage tanks where they can be held, mixed, or transferred. The sludges are next chemically treated to assist dewatering and are stirred and air-agitated to ensure thorough mixing. After conditioning, the sludge is dewatered by pressure to produce a solid sludge cake containing 65% moisture. The sludge cake is incinerated in two of three furnaces which operate at any one time. The liquid produced by dewatering is pre-treated at the incinerator so that it may be processed with normal sewage at the nearby sewage treatment plants. (See also W76-12609) (Kreager-FIRL)
W76-12610

COMPACT INCINERATOR FOR SOLID AND LIQUID WASTES.
Processing, Vol. 22, No. 5, p 33, May, 1976. 1 fig, 1 tab.

Descriptors: *Sludge disposal, *Sewage disposal, *Oil wastes, *Incineration, Waste disposal, Equipment, Solid wastes, Liquid wastes, Sludge.

A small, self-contained incinerator known as the 'Furnapak' which incorporates several design features of larger multiple hearth furnaces is available for applications involving the burning of sewage screening, oily wastes, and sewage sludges. The incinerator uses a rotating rabble shaft and air injection in a manner similar to multiple hearth furnaces. Both solid and liquid wastes can be incinerated either simultaneously or independently. Solid waste is loaded manually onto a solid bowl refractory hearth through an air-operated door large enough to accommodate standard refuse sacks. Liquid wastes and pumpable sludge are introduced into the incinerator through a tangentially mounted inlet port. Problems of burner blockage are avoided by the use of a simple weir type burner in which the fuel falling over the weir is atomized by low pressure air from the main combustion air fan. Any mixture of waste oil, oily water, sewage, and other sludges containing solids particles up to 0.5-inches in size can be handled efficiently. The incinerator is capable of feed rates up to 350 kilograms/hour for feeds containing up to 80% moisture. (Kreager-FIRL)
W76-12612

SUBMERSIBLE PUMPS UPGRADE SEWAGE HANDLING.
For primary bibliographic entry see Field 5D.
W76-12614

SLUDGE TREATMENT, UTILIZATION, AND DISPOSAL, (LITERATURE REVIEW),
Delaware Univ., Dept. of Civil Engineering, Newark.
For primary bibliographic entry see Field 5D.
W76-12630

SOD PRODUCTION: AN EXPERIMENT IN SLUDGE DISPOSAL,
Florida Public Works Administration, St. Petersburg.
W. T. White, Jr.
Public Works, Vol. 107, No. 6, p 104-106, June, 1976. 2 fig, 1 tab.

Descriptors: *Turf, *Sludge disposal, *Sludge, *Topsoil, *Land use, Mixing, Grasses, Tile drainage, Soil types, Ditches, Solid wastes, Moisture, Waste disposal.
Identifiers: Sandy soils, Land application, Sod production.

A project was begun in St. Petersburg, Florida, to use sludge from waste water treatment plants to develop topsoil and eventually grow sod for city parks and recreation areas. Sludge was distributed into furrows dug by a tractor and then blended with the soil using a tractor attachment. During the first yr, an 18 inch layer of topsoil was created which produced superior grass growth when transferre to city parks and street parkways. A 23-acre area was used. The site was completely tile drained at an average depth of 3.5 ft. The sandy soil had an interference of shell commencing at a depth of about 24 inches. The area was bordered by a 6 ft deep drainage ditch whose contents were pumped to a holding pond south of the site. Sludge solids were retained at the soil surface, part of the moisture evaporated, and any excess was collected bydrain tile and carried to the drainage ditch. Sludge spraying was discontinued for 3 days after a heavy rain, because an inch of rain contributed moisture equivalent to 3 days of operation. (Snyder-FIRL)
W76-12633

PERSISTENCE OF VIRUS ON SEWAGE-IRRIGATED VEGETABLES,
Ohio Bureau of Foods, Cincinnati. Virology Branch.
For primary bibliographic entry see Field 5B.
W76-12634

ALUM SLUDGE DRYING WITH BASIC EXTRACTIVE TREATMENT,
Resources Conservation Co., Renton, Wash.
R. L. Olson.
American Water Works Association Journal, Vol. 68, No. 6, p 321-323, June, 1976.1 fig, 2 tab.

Descriptors: *Sludge, *Drying, *Sludge treatment, *Solvents, *Organic matter, Inorganic compounds, Dewatering, Economics, Suspended solids, *Waste treatment.
Identifiers: *Basic extractive sludge treatment.

A new system has been developed to reduce problem sludges, including alum, to a dry state suitable for recycling or landfilling. The method called B.E.S.T. (basic extractive sludge treatment), utilizes a solvent with unique properties that conditions both organic and inorganic sludges while enhancing the solids' dewatering and separation properties. The overall relative economics of the process depend on the specific sludge to be processed, the nature of existing alternatives for sludge disposal, and the availability of existing component hardware that can be incorporated into it. The process can satisfy all applicable Enviro

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mental Protection Agency (EPA) guidelines. When a combination of the solvent and water is cooled below approximately 65 F, they become completely mixed, whereas suspended solids contained in a liquid mixture are easily separated mechanically. Raising the liquid temperature to approximately 140 F allows the water and solvent to be separated by decanting. A Mini-B.E.S.T. unit was tested with various sludges to test the validity of the system. All system design goals were met during this testing. When the system was tested with alum sludge, the 52% liquid remaining in the filter cake was all solvent. The solvent has an evaporative value of 135 Btu/lb as opposed to approximately 1000 Btu/lb for water, resulting in one of the major energy economies in the B.E.S.T. system. The Mini-B.E.S.T. system was able to remove over 99% of the suspended solids from an organic sludge slurry and deliver 95% or more dry, pathogen-free solids and a clear, sterile effluent. Energy requirements are relatively low and environmental impact is negligible. (Snyder-FIRL)
W76-12641

TURN SEWAGE INTO FUEL.
For primary bibliographic entry see Field 5D.
W76-12643

EFFLUENT IRRIGATION OF RYE AND RYEGRASS,
Florida Univ., Gainesville. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5D.
W76-12644

PHILADELPHIA SLUDGE: WHERE TO PUT IT.
Civil Engineering-ASCE, Vol 46, No 6, p 60-62, June, 1976.

Descriptors: *Sewage treatment, *Sludge disposal, *Ultimate disposal, *Pennsylvania, *Sewage sludge, Atlantic Ocean, Land use, Oceans.
Identifiers: *Philadelphia(Penn).

Philadelphia dumps at least part of its sewage sludge in the open ocean, but the Environmental Protection Agency (EPA) has ordered it to discontinue this practice by 1981. Increased mercury, nickel, lead, and nitrate concentrations have been detected at the dumpsites. There was no apparent evidence of accumulation of organics and nutrients or changes in phytoplankton populations. Philadelphia officials believe that the dumping should not be banned. They are, however, evaluating 10 treatment-disposal alternatives. These include giving away the dried sludge for use as a fertilizer. A Recycling Center may also be set up to handle sludge for shipment. Sludge will be applied on a trial basis to farmland south of the city. Use of sludge to reclaim strip-mined lands has also been considered. Because of expected objections, Philadelphia will cooperate with several universities in studying sludge application to strip-mined land. In similar tests using Scranton sludge, the alkaline sludge helped neutralize the acidic strip-mined land and added humus. (Snyder-FIRL)
W76-12657

5F. Water Treatment and Quality Alteration

SEVERAL HYDROBIOLOGICAL PROBLEMS OF GROUND WATER STORAGE IN METROPOLITAN WATER WORKS (BUDAPEST): I, (IN GERMAN),
Lajos Kossuth Univ., Debrecen (Hungary). Zoological Inst.
J. Szabo, G. Pusztai, G. Devai, I. Devai, and K. Gefferth.
Acta Biol Debrecina. 10/11, p 191-200, 1972/1973.

Descriptors: Europe, *Hydrobiology, *Water storage, Groundwater basins, *Water works, *Colloids, *Detritus, Municipal water, Cities, *Silts, *Design, Maintenance, Treatment facilities.
Identifiers: Budapest(Hungary), Colloids.

Plans are discussed for the optimum design and maintenance of a purification basin to prevent the transfer of fine silt, organic and inorganic colloids and detritus to the storage basin, since this is the cause of its occasional blockage.--Copyright 1975, Biological Abstracts, Inc.
W76-12258

A NEW STANDARD 'DRINKING WATER' (GOST 2874-73) AND ITS SCIENTIFIC BASIS, (IN RUSSIAN),
Moskovskii Gosudarstvennyi Meditsinskii Institut (I) (USSR).
For primary bibliographic entry see Field 5G.
W76-12317

PRELIMINARY STUDIES OF ASBESTIFORM FIBERS IN DOMESTIC WATER SUPPLIES,
California Univ., Berkeley.
For primary bibliographic entry see Field 5A.
W76-12325

HYGIENIC EVALUATION OF ELECTRODIALYSIS WATER DESALINATION SET UP, (IN RUSSIAN),
Moskovskii Gosudarstvennyi Meditsinskii Institut (I) (USSR). Dept. of General Hygiene; and Moskovskii Gosudarstvennyi Meditsinskii Institut (I) (USSR). Dept. of Public Hygiene.
For primary bibliographic entry see Field 5D.
W76-12394

ALUM RECOVERY AND WASTE DISPOSAL IN WATER TREATMENT,
Metcalf and Eddy, Inc., New York. (Assignee).
G. P. Fulton.
U. S. Patent No. 3,959,133, 4 p, 3 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 946, No 4, p 1739, May 25, 1976.

Descriptors: *Patents, *Water treatment, *Water purification, *Water quality control, Treatment facilities, Sludge treatment, Sludge disposal, Suspended solids, Coagulation.
Identifiers: *Alum(Aluminum sulfate) recovery.

In water treatment plants, particularly for large municipalities, alum (aluminum sulphate) is commonly used in the coagulation and clarification process. During the treatment the alum is converted essentially to aluminum hydroxide. The aluminum hydroxide, together with suspended solids including suspended matter in the raw water, precipitates resulting from the treatment process, additives, etc form a sludge which must be disposed of. The invention is directed to the provision of a water treatment system and process which normally utilizes alum recovery and yields a neutral cake for convenient disposal, provides for periodic elimination of contaminated recovered alum, and permits operation without alum recovery when required by abnormal conditions. (Sinha - OEIS)
W76-12399

APPARATUS FOR BIOLOGICAL AND CHEMICAL PURIFICATION OF WATER BY AGGLOMERATION,
Agrotechnika, narodny podnik, Zvolen (Czechoslovakia). (Assignee).
S. Mackrle, and V. Mackrle.
U. S. Patent No. 3,959,144, 5 p, 6 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 946, No 4, p 1743, May 25, 1976.

Descriptors: *Patents, *Water purification, Water quality control, *Biological treatment, Chemical reactions, Flocculation, *Separation techniques, *Water treatment, Waste water treatment, Equipment.
Identifiers: *Chemical treatment, *Separation tanks.

A water purification plant composed of standard elements is arranged in such a way that all the spaces are formed for either chemical or biological water purification. The arrangement is composed of at least two tanks with substantially cylindrical mantles aligned side by side horizontally and with their axes parallel. Adjacent tanks, whose length is larger than their diameter, are mutually connected by inclined walls placed tangential to the mantles of the tanks. Inclined walls, adjacent upper parts of the mantles of the tanks and front and rear walls determine a separating space for the separation of the floccular suspension from the purified water. (Sinha - OEIS)
W76-12401

REVERSE OSMOSIS SYSTEM WITH AUTOMATIC FLUSHING,
Desalination Systems, Inc., Escondido, Calif. (Assignee).
For primary bibliographic entry see Field 5D.
W76-12402

TECHNIQUE FOR CONTINULUSLY ANALYZING THE CONCENTRATION OF OZONE DISSOLVED IN WATER,
Fischer and Porter Co., Warminster, Pa. (Assignee).
J. J. Morrow, and L. L. Dailey.
U.S. Patent No. 3,960,673, 4 p, 4 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 947, No 1, p 294, June 1, 1976.

Descriptors: *Patents, *Water purification, *Water treatment, *Water pollution treatment, *Ozone, Disinfection, Oxidation, *Monitoring, Measurement, Instrumentation, Cathods, Anodes, Pollutant identification.

Ozone is extensively used in the purification of drinking water, the treatment of sewage and industrial wastes, as well as in various chemical manufacturing processes. To attain an effective germicidal action serving to destroy pathogens and all harmful bacteria and to react with oxidizable organic or inorganic chemical traces present in water, it is essential that the ozone concentration be in a predetermined range, such as 0.1 to 1 ppm. Below this range, the concentration is inadequate for its intended purpose. A technique is described for continuously indicating the concentration of ozone dissolved in water. Use is made of an amperometric cell, preferably formed of a gold cathode concentrically placed within a tubular copper anode to define an annular passage, the cathode being rotated at high speed. A sample stream of water is directed through the passage at a predetermined flow rate whereby in the absence of dissolved ozone, the cathode is polarized, but in the presence of it, depolarization takes place to cause a current to flow in the cell. The current is measured to provide a reliable and continuous reading of ozone concentration. (Sinha-OEIS)
W76-12405

WATER QUALITY OBJECTIVES.
Environmental Protection Service, Regina (Saskatchewan). Water Pollution Control Branch.
For primary bibliographic entry see Field 5G.
W76-12588

OPTIMAL TIMING AND SIZING OF A CONJUNCTIVE WATER SUPPLY AND WASTEWATER SYSTEM, USING NONLINEAR PROGRAMMING,
California Univ., Los Angeles.
M. E. Mulvihill.

Available from University Microfilms, Inc., Ann Arbor, Mich., 48106. Order No. 73-18641. Ph. D. Thesis, 1973, 134 p.

Descriptors: *Mathematical models, *Water supply, *Waste water treatment, Water reuse, Planning, Water quality, Algorithms, Linear programming, *Water treatment, Model studies, Optimization.

A mathematical model of a conjunctive urban water supply and waste water system, consisting of the minimization of a concave objective function subject to linear constraints, has been formulated and applied to the City of Los Angeles. The objectives are: to minimize the cost of supplying water from several sources, including the provision for recycling reclaimed water; and, to determine the capacity expansion schedule of the water and waste water treatment processes. A multilevel solution technique is developed to determine the minimum cost alternative for a selected planning horizon. The first level of the algorithm is an iterative process in which the objective function is successively linearized and a series of linear programs is solved. When this yields no improvement, the second level, a search of neighboring extreme points, is initiated. If there is an improvement at this level, the procedure returns to the first level and continues. The model and solution technique were successfully applied to an actual case and the results can be used as an aid in the comprehensive planning of the system. The mathematical model is flexible in that it can be expanded to include additional water quality constituents, advanced waste water treatment processes, and variations in water quality standards. (Sandoski-FIRL)
W76-12621

ALUM SLUDGE DRYING WITH BASIC EXTRACTIVE TREATMENT,
Resources Conservation Co., Renton, Wash.
For primary bibliographic entry see Field 5E.
W76-12641

5G. Water Quality Control

THE WINOOSKI WORKSHOPS: AN ASSESSMENT OF SPECIFIED WORKSHOP TECHNIQUES FOR STIMULATING AND IMPROVING PUBLIC INVOLVEMENT IN WATER RESOURCES,
Vermont Univ., Burlington. Water Resources Research Center.
For primary bibliographic entry see Field 6B.
W76-12151

THERMAL ANALYSIS OF FROZEN EMBANKMENT ISLANDS,
Puget Sound Naval Shipyard, Bremerton, Wash.
For primary bibliographic entry see Field 2L.
W76-12200

A LIMNOLOGICAL STUDY OF SPIRITWOOD LAKE, N. D., WITH SPECIAL EMPHASIS ON ITS WATER QUALITY, SEASONAL CYCLES OF CHEMICAL NUTRIENTS, PHYTOPLANKTON, ZOOPLANKTON AND PRIMARY PRODUCTION, PART I: PHOTOSYNTHETIC PRODUCTION AND ENERGY CONVERSION IN SPIRITWOOD LAKE, NORTH DAKOTA,
North Dakota State Univ., Fargo. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W76-12213

A LIMNOLOGICAL STUDY OF SPIRITWOOD LAKE, N. D., WITH SPECIAL EMPHASIS ON ITS WATER QUALITY, SEASONAL CYCLES OF CHEMICAL NUTRIENTS PHYTOPLANKTON, ZOOPLANKTON AND PRIMARY PRODUCTION, PART II: CAUSES AND CONTROL OF ALGAL BLOOMS IN SPIRITWOOD LAKE, NORTH DAKOTA,
North Dakota State Univ., Fargo. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W76-12214

ECONOMIC COSTS OF CONTROLLING WATER QUALITY THROUGH MANAGEMENT OF IRRIGATION RETURN FLOWS,
Washington State Univ., Pullman. Coll. of Agriculture.
G. H. Pfeiffer, and N. K. Whittlesey.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 517, $4.50 in paper copy, $3.00 in microfiche. Completion Report, August 1976. 58 p, 6 fig, 16 tab, 17 ref. OWRT B-059-WASH(2). 14-31-0001-5125.

Descriptors: Economics, *Water quality control, Irrigation, *Return flow, Nitrogen, Water temperature, Sediments, *Water management(Applied), Model studies, *Alternative costs, Water policy, Cost analysis, *Pollution abatement.

This study focuses on the economic and social costs of alternative policies that could be used to control water quality through management of irrigation return flows. Three environmental quality parameters associated with irrigated agriculture were singled out for analysis. These parameters were river water nitrogen concentration, river water temperature and loss of sediment from irrigated farms. A dual simulation and linear programming model was used as the vehicle of analysis. Policies considered for analysis included taxing water and nitrogen inputs, reducing water rights, and improved management techniques. Results indicated that improvement of water quality in the study area is possible through the control of agricultural inputs and activities. Improvement of the receiving water to a point suitable for most uses could reduce farm income 16 to 41 percent, depending on the policy employed. A trade-off existed between economic efficiency and distribution of abatement costs. Policies that relied on higher input prices for rationing tended to more efficiently allocate resources than policies that set arbitrary input use quotas. However, these more efficient policies having low total social costs also imposed higher costs on agriculture. The results indicate that considerable improvement in water quality is possible, perhaps 50 percent of that desired, at very little cost to agriculture or the public. Better management and more efficient irrigation methods could achieve this level of abatement very cheaply. Higher levels of abatement, however, become very expensive.
W76-12218

COASTAL ENGINEERING CONFERENCE. FOURTEENTH. PROCEEDINGS. COPENHAGEN, DENMARK, JUNE 24-28, 1974.
American Society of Civil Engineers, New York.
Coastal Engineering Conference. Fourteenth. Proceedings. held in Copenhagen, Denmark, June 24-28, 1974. 3 Volumes, 2580 p.

Descriptors: *Coasts, Engineering structures, Sediments, Sedimentation, Resources development, Water resources, Exploration, Exploitation, Environmental effects.
Identifiers: *Outer Continental Shelf, Environmental impact.

This collection of papers in three volumes constitute the proceedings of the 14th Coastal Engineering Conference held in Copenhagen, Denmark, June 24-28, 1974. The Conference was sponsored by Coastal Engineering Research Council and Waterways, Harbors, and Coastal Engineering Division, American Society of Civil Engineers; Ministry of public Works of Denmark; Danish Hydraulic Institute; Institute of Hydrodynamics and Hydraulic Engineering, Technical University of Denmark; and Danish Society of Civil Engineers. The papers are arranged by the following subject groupings: Theoretical and observed wave characteristics, Coastal sediment problems, Coastal Structures and related problems; and Coastal, estuarine and environmental problems. Pertinent papers are separately abstracted. (See W76-12222 and W76-12223) (Sinha-OEIS)
W76-12221

ENVIRONMENTAL ANALYSIS FOR BAHAMAS SUPERTANKER PORT,
Erindale College (Ontario).
W. Harrison.
In: Coastal Engineering Conference. Fourteenth. Proceedings, held in Copenhagen, Denmark, June 24-28, 1974, Vol III, Chap. 151, p 2551-2567, 1974. 9 fig, 11 ref.

Descriptors: *Environmental effects, *Oil spills, *Oil pollution, Water resources, *Resource development, Continental Shelf, Ports, Winds, Currents(Water), Aquatic drift, Atlantic Ocean, Water pollution sources.
Identifiers: *Outer Continental Shelf, *Superports, Supertankers, Wind effects, *Bahama Islands.

From the point of view of the Bahamian environment, the most favorable locations for a supertanker port are the western margin of the Great Bahama Bank; the western shores of Grand Bahama Island; and the western margin of Little Bahama Bank. A port in any of these areas would (1) usually be located down-wind and down-current of the majority of Bahamian islands and shallows, (2) be located adjacent to boundary currents, especially the Florida Current, that would tend to carry large accidental oil spills away from coastal areas and into the North Atlantic, and (3) be located where wave energies would be relatively low, and (4) be positioned close to sea-lanes, obviating supertanker penetration of the central Bahamas. A site 30 miles east of Freeport, Grand Bahama Island, was chosen for construction of a sea-island supertanker bunker. Six controlled spills (270 U.S. gals. each) of crude and two spills of naptha were made at the sea-island site during the windiest month (February). Slick spreading rates are presented. Cumene and all lower-boiling aromatics disappeared within the first 90 minutes after a crude-oil spill; a majority of toxic fractions (BP < 220 deg C) disappeared within 3 to 8 hours. Slick-drift roses for extreme-wind-persistence and strongest-coastal-current conditions indicate the environmental suitability of the site for capture and cleanup of small spills (< 1000 gal.). (See also W76-12221) (Sinha-OEIS)
W76-12222

ENVIRONMENTAL PROBLEMS ASSOCIATED WITH A PIPELINE LANDFALL IN COASTAL DUNES AT CRUDEN BAY, ABERDEENSHIRE, SCOTLAND,
Aberdeen Univ. (Scotland).
W. Ritchie.
In: Coastal Engineering Conference. Fourteenth. Proceedings, held in Copenhagen, Denmark, June 24-28, 1974, Vol III, Chap. 152, p 2568-2580, 1974.

Descriptors: *Environmental effects, *Pipelines, *Resources development, Water resources, *Oil industry, Continental Shelf, Coasts, Bays, Dunes, Beaches.
Identifiers: *Outer Continental Shelf, Environmental impact, North Sea, Scotland, Pipeline landfall.

The first oil pipeline from the North Sea area reached Scotland in 1973. The landfall, at Cruden Bay, Aberdeenshire, is a sediment-filled, bay-head beach with coastal dunes. Environmental and landscaping problems arose with the trenching of the beach and dune areas. Various methods, including flexible fence construction, spraying wi

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a bitumen compound and spreading of soil over vulnerable areas, protected the site successfully. Full revegetation took place later and the beach and dune area are now restored to their original condition. Environmental management techniques were designed to preserve the high amenity and ecological status of the site and minimise the risk of side-effects, both during and after engineering work. (See also W76-12221) (Sinha-OEIS)
W76-12223

OCEAN 72, IEEE INTERNATIONAL CONFERENCE ON ENGINEERING IN THE OCEAN.
Institute of Electrical and Electronics Engineers, Inc., New York.
Ocean 72, IEEE International Conference on Engineering in the Ocean, held Newport, Rhode Island, September 13-15, 1972. 613 p.

Descriptors: *Resources development, Water resources, *Water quality control, Environmental effects, *Pollution, Instrumentation, *Engineering, Continental shelf, Tidal power, Biology, Remote sensing, Models, Acoustics, Data processing, Nuclear powerplants, Navigation, Optics, Underwater, Sediments, Materials, Exploration, Seismic properties.
Identifiers: *Outer Continental Shelf.

This collection of papers constitutes the proceedings of the conference on Engineering in the Ocean held at Newport, Rhode Island, September 13-15, 1972. Papers are grouped according to the following subjects: Signal Processing; Tidal power; Marine Bio-Electronics; Project Sanguine; Electromagnetic Remote Sensing; System Modeling and Optimization; Underwater Acoustics; Magnetic and Electromagnetic Methods; Data Collection and Reduction; Pollution Measurements; Offshore Nuclear Generating Stations; Navigation, Positioning and Tracking; Instrumentation; Underwater Optics; Sediment Properties and Seismic Profiling; and Materials. (See W76-12225) (Sinha-OEIS)
W76-12224

ENVIRONMENTAL CONSIDERATIONS OF OFFSHORE GENERATING STATIONS,
Public Service Electric and Gas Co., Newark, N.J.
R. Roney.
Ocean 72, IEEE International Conference on Engineering in the Ocean, held Newport, Rhode Island, September 13-15, 1972. p 419-421, 2 ref.

Descriptors: *Offshore platforms, *Environmental effects, *Resources development, Water resources, *Nuclear powerplants, Thermal pollution, Continental Shelf, Biota, Ecosystems, Breakwaters, Model studies, Radiation, Monitoring, Planning.
Identifiers: *Outer Continental Shelf, *Environmental impact, Artificial reefs.

The environmental considerations and the supporting program of studies for the offshore nuclear generating station is described and some of the anticipated environmental effects of the plant are discussed. A large amount of on-site investigation, laboratory experiments, and analysis is being carried out as a basis for an accurate prediction of the environmental impact. Physical models of the intake water are being tested for wave effects. An on-site ecological survey is including sampling of the marine biota on an extensive scale. A prediction of the thermal effluent release pattern is being conducted by both computer model and physical modeling. An oceanographic survey is measuring currents, temperatures, etc. Measurement of the existing natural background of radiation will be conducted. No adverse effects on the environment are predicted from studies conducted so far. (See also W76-12224) (Sinha-OEIS)
W76-12225

SOME CAUSES OF ANOMALIES IN OXYGEN MASS TRANSFER IN POLLUTED WATER, (IN RUSSIAN),
Akademiya Nauk Latviiskoi SSR, Riga. Inst. of Wood Chemistry.
For primary bibliographic entry see Field 5D.
W76-12265

DETERMINATION OF THE CONDITIONS OF DISCHARGE OF SEWAGE INTO WATERS, (IN RUSSIAN),
Ministerstvo Zdravookhraneniya SSSR, Moscow. Institut Biofiziki.
V. M. Prusakov, and I. A. Voronova.
Gig Sant. 38(7), p 65-66, 1973.

Descriptors: *Water quality standards, Regulation, Waste disposal, *Sewage disposal, Lethal limit, *Toxicity, Water pollution control.
Identifiers: *Maximum allowable concentrations, *USSR.

The main document (USSR) on the basis of which the sanitation engineer determines the conditions of sewage discharge into waters is the Regulations for Preservation of Surface Waters. The list of maximum allowable concentrations contained should be supplemented by a list of threshold concentrations expressed in fractions of the maximum allowable concentrations. In the case of the simultaneous content of substances in sewage with the same or close concentrations, the limiting index of harmfulness for each substance is that which requires a maximum decrease of the maximum allowable concentration. The effect of summation of the threshold concentrations should be considered.--Copyright 1975, Biological Abstracts, Inc.
W76-12266

A STOCHASTIC MODEL FOR PREDICTING THE PROBABILITY DISTRIBUTION OF THE DISSOLVED-OXYGEN DEFICIT IN STREAMS,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 5B.
W76-12276

PROPOSED CROSS-FLORIDA BARGE CANAL: WATER-QUALITY ASPECTS, WITH A SECTION ON WASTE-ASSIMILATIVE CAPACITY,
Geological Survey, Tallahassee, Fla.
A. G. Lamonds, and M. L. Merritt.
Water-Resources Investigations No 76-23, February 1976. 189 p, 37 fig, 29 tab, 44 ref.

Descriptors: *Water pollution sources, *Canal construction, *Baseline studies, *Water quality, *Florida, Environmental effects, Surface waters, Groundwater, Aquifers, Seepage, Water table, Data collections, Evaluation.
Identifiers: *Cross-Florida barge canal.

This route of the partly completed Cross-Florida Barge Canal follows the St. Johns, Oklawaha and Withlacoochee Rivers. If the canal is completed, the Summit Reach, connecting the Oklawaha and Withlacoochee Rivers will be excavated into the Floridan aquifer. Large springs that discharge from this limestone and dolomite aquifer flow to the Oklawaha and Withlacoochee Rivers. These streams and the aquifers in much of the area contain a calcium bicarbonate water which has an average dissolved solids concentration of less than 300 mg/liter and generally is suitable for most uses. Dense groths of aquatic plants in Lake Ocklawaha and Lake Rousseau, existing impoundments for the Barge Canal, have caused large diel variations and stratification of dissolved oxygen. Problems of canal construction on the quality of water include increased turbidity and suspended sediment concentrations during dredging and land clearing operations. The impoundment of Eureka Pool in the Oklawaha River will probably result in increased aquatic plant production and large variations in dissolved oxygen concentrations similar to those in Lake Ocklawaha. In some parts of the canal, canal water will move into the aquifer, so the quality of ground water in those places will depend partly upon the quality of water in the canal. Seepage from the canal to the aquifer is expected to be larger in the Summit Reach than in any other reach. (Woodard-USGS)
W76-12283

THE EXTENT OF HAZARD AND THE HYGIENIC STANDARDIZATION OF ISOPHTHALONITRILE IN BODIES OF WATER, (IN RUSSIAN),
Sanitarno-Gigienicheskii Meditsinskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 5C.
W76-12286

DEVICE FOR AERATING WATER BODIES, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Inst. of Hydromechanics.
V. M. Karasik, and I. I. Stovbun.
Gidrobiol Zh. 10(6), p 108-111, 1974.

Descriptors: *Aeration, Algae, *Cyanophyta, Design, Treatment facilities, Water pollution control, Pollution abatement, Design criteria, Operations.

A design for an aeration plant for water bodies is proposed and its zone of effective action established. The parameters and operating regime of the aeration plant needed for suppressing the activity of blue-green algae were determined. The plant is recommended for small water bodies (up to 50 ha) with a depth of 5 m.--Copyright 1975, Biological Abstracts, Inc.
W76-12311

A NEW STANDARD 'DRINKING WATER' (GOST 2874-73) AND ITS SCIENTIFIC BASIS, (IN RUSSIAN),
Moskovskii Gosudarstvennyi Meditsinskii Institut (I) (USSR).
S. N. Cherkinskii.
Gig Sanit. 6, p 7-11, 1974.

Descriptors: *Potable water, *Water quality standards, *Bacteria, *Coliforms, Organoleptic properties, Nitrates, Ions, Chlorides, Phosphates, Iron, Sulfates, Manganese, Aluminum, Arsenic, Lead, Toxicity.
Identifiers: Acrylamide, Beryllium, Fluorine, Molybdenum, Selenium, Silver, Strontium, *USSR.

The composition and properties of drinking water must meet certain standards concerning the degree of total bacterial contamination and content of coliform bacteria, harmlessness of the chemical composition and its favorable organoleptic properties. The previous standard specified permissible levels of only 3 toxic substances found in natural water (As 0.05 mg/l, Pb 0.1 mg/l and F 1.5 mg/l). Five additional substances are specified in the new standard (Be 0.0002 mg/l, Mo 0.5 mg/l, Se 0.001 mg/l, Sr 2 mg/l and nitrates (with respect to N) 10.0 mg/l), and flocculant polyacrylamide (2 mg/l) and Ag ions (0.05 mg/l) are specified for the 1st time. The new standard also specifies dry residue content of not more than 1000 mg/l, chlorides 300 mg/l, sulfates 500 mg/l, Fe 0.3 mg/l, Mn 0.1 mg/l, residual Al 0.5 mg/l and polyphosphates 3.5 mg/l.--Copyright 1975, Biological Abstracts, Inc.
W76-12317

PHOSPHORUS DEFICIENCY IN CATTLE FROM THE BRASILIA REGION OF BRAZIL, (IN PORTUGESE),
Departamento de Pesquisas e Exp., Brasilia (Brazil).
M. D. S. Dayrell, J. Doebereiner, and C. H. Tokarnia.

Pesqui Agro Pecu Bras Ser Vet. 8(6), p 105-114, 1973.

Descriptors: *Phosphorus, *Cattle, South America, *Grasses, Water pollution control.
Identifiers: Aristida-Sp, Brasilia, *Brazil, Hyparrhenia-Rufa, Melinis-Minutiflora.

Young male cattle were studied under range conditions in 4 'cerrado' areas of Brazilia (Sobradinho, Planaltina, Formosa and Luziania) for a period of 14-21 mo. Serum Pi values were determined at monthly intervals during this period. At the same time analyses of P in grass samples of Melinis minutiflora, Hyparhenia rufa and Aristida sp., were carried out, as well as soil analyses. The results of the serum Pi estimations from cattle in the areas of Sobradinho and Planaltina were in agreement with the herd histories, which indicated that the Sobradinho area was not deficient in P and that the Planaltina area was deficient in P. In the areas of Formosa and Luziania, the serum Pi levels were intermediate, and also in agreement with the herd histories, which indicate a moderate P deficiency. There was a significant correlation between the P values in the blood serum and the value of the 3 grass species with the exception of the area where there was the most severe P deficiency. There was a correlation between the P values of the soil and the yearly average serum Pi value of the cattle from all 4 areas. No correlation was found between rainfall and Pi levels in the blood serum in P deficient areas, but in the area where there is no P deficiency there was a close correlation between increased rainfall and increased Pi in the blood serum.--Copyright 1975, Biological Abstracts, Inc.
W76-12322

ROLE OF AGRICULTURE IN THE QUALITY OF THE NEW HAMPSHIRE ENVIRONMENT,
New Hampshire Univ., Durham. Inst. of Natural and Environmental Resources.
R. D. Harter.
Presented at Conference on Agricultural and Processing Wastes in the Eastern Region: A Perspective, Philadelphia, Pennsylvania, December 1-3, 1970, p. 78-83. 2 tab.

Descriptors: *Farm wastes, Oxidation lagoons, Waste treatment, *Agriculture, *Environment, *New Hampshire, *Cattle, *Waste disposal, Lagoons, Swine, Poultry, Water pollution control, Odor.

The majority of New Hampshire's land area is too hilly to support an economically viable agricultural operation. A large portion of the remaining area is too wet to farm. Fruit and vegetable farming has been of minor importance. But the steady increase in tourism is encouraging roadside vegetable stands. New Hampshire has a minor animal industry when compared to many states. Sheep are largely confined to the hillier less populated regions of the state. Hog production is scattered across the state, a few hogs to a farm. Poultry production is nearer populated areas and is often accompanied by odor problems. Cattle contribute appreciably to the agricultural waste problem. Waste produced by cattle is roughly equivalent to that produced by the entire human population of the state. Mass waste disposal systems are uneconomical because few dairy herds exceed 100 head, and the majority are less than 30 head. Although oxidation ponds are more acceptable than lagoons, the structure still has generally not been acceptable as a waste disposal method. The New Hampshire Cooperative Extension Service personnel are meeting with farmers and are educating them to the role they must undertake. This service has been the most important single factor in the control of pollution from agricultural sources. (Cameron-East Central)
W76-12337

EVALUATING A LOW-ENERGY, HIGH-VOLUME PUMP FOR ODOR REDUCTION FROM LIVESTOCK WASTE LAGOONS BY MIXING,
Oklahoma State University, Stillwater. Dept. of Agricultural Engineering.
C. E. Rice.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 777, $3.50 in paper copy, $3.00 in microfiche. Completion Report, (1976). 19 p, 7 fig, 1 tab, 2 ref. OWRR A-051-OKLA(1).

Descriptors: Lagoons, Odor, *Mixing, Gases, Reservoirs, Waste water treatment, Biochemical oxygen demand, *Farm wastes, Pumps, Livestock, Conductivity, Chemical oxygen demand, *Farm lagoons, Oxidation lagoons.
Identifiers: *Anaerobic lagoons, *Propeller pumps, *Odor reduction.

A low-energy, high-volume propeller pump was placed in a lagoon receiving manure material from a confined housing with pit collection swine production operation to evaluate its effectiveness in the reduction of offensive odors from the lagoon. The retention time in the pits was 26 days or greater. Another lagoon of the same size (0.405 hectare surface area by 2.2 m deep), subject to similar conditions, was close by and provided a comparison of a treated (lagoon with pump) system with an untreated (lagoon without pump) system. The lagoons were anaerobic, very turbid and had no dissolved oxygen. The pump could completely mix the lagoon liquid about every four hours and it was operated from July 17, 1975 through Jauary 6, 1976. COD, BOD5, DO, pH, temperature, conductivity and general observations were obtained on a weekly basis beginning two weeks before start-up of the pump and through May, 1976. The observed results for the treated and untreated systems followed the same pattern. This indicated that the pump was not having a significant effect on the lagoon. The major difference observed was that the boiling activity, caused by the release of accumulated gases from the lagoon to the atmosphere, of the treated lagoon was reduced significantly compared to the untreated lagoon.
W76-12344

LOW-COST DISPOSAL SYSTEMS FOR FEEDLOT RUNOFF,
Agricultural Research Service, Lincoln, Nebr.
N. P. Swanson, and C. L. Linderman.
Agricultural Engineering, Vol. 55, No. 11, p 20-21, November, 1974. 3 fig.

Descriptors: *Agricultural runoff, *Feed lots, Disposal, *Costs, Irrigation, *Waste disposal, *Farm wastes, Sprinkler irrigation, Percolation, Waste treatment.

Cattle feeders are required by law to control runoff from their feedlots. The most practical method for disposing of runoff is land disposal through irrigation. The feeder needs a low-cost disposal system that is fitted to a minimum land area. The Soil Conservation Service recommends a disposal area 1 1/2 to 2 times larger than the contributing feedlot, but the specific area needed for disposal to empty the holding pond at any one time should be no longer than the feedlot. The runoff may be disposed of by a gravity flow system or through sprinkler irrigation. Gravity disposal through gated pipe, hoses, or single point discharge may require land preparation, some form of pump, protection from freezing, and it may require more labor. Sprinkler distribution requires more power, may require a reuse pit due to the runoff caused by the distribution, and may cause excess wetting during the seedling stage or just before harvest, thus damaging crops. Care must be taken in selecting irrigation components and in scheduling field applications. The larger the system, the more consideration should be given to application and distribution efficiencies. The most important considerations for smaller systems are low investment and labor costs. With either type, care must be taken to avoid ponding and mosq breeding. Also the area should be located to advantage of prevailing winds to avoid odor b up near residences. (Merryman-East Central)
W76-12346

LITTLE POLLUTION FROM THIS FEEDLO
Agricultural Research, Vol. 19, No. 6, p 1
December, 1970. 2 fig

Descriptors: *Feed lots, *Nebraska, Anal Nitrates, Gases, Nitrification, Climates, * wastes, Water pollution control.
Identifiers: Manure pack.

The results of an investigation concerning ni pollution of a shallow groundwater table, ducted on a flat cattle feedlot in Nebraska discussed. The 120-by-305 ft. lot was chose study because of such conditions as: stocking of 400 sq. ft. per animal; little manure rem highly permeable soil; fluctuating high-w table; and little surface drainage. Observation measurements indicated that the manure (nearly 1 ft. thick) and the soil and manure fo common interface that effectively bars movement. Analysis of soil core samples sh that downward movement of nitrates and forms of nitrogen in the soil is minor. Prom by interface of aerobic conditions in the pac anaerobic conditions below the interface lea generation of nitrates by nitrification in the bic zone, while breakdown by denitrificatio curs in the anaerobic zone. Biological activi the two zones creates gaseous compounds su ammonia, carbon dioxide, and amines, whic dispersed into the atmosphere. Seven wells installed in and around the lot to obtain water ples and water table depth measurements. samples were taken periodically from wells n the feedlot and analyzed. The estimates indi that 20 to 40 percent of Nebraska cattle fe operations are on flat, permeable soil. The surements indicated that considerable amou solid wastes can be removed simply by de position on the lot. These field observation supported by results of laboratory studies. Central)
W76-12350

KEEPING RUNOFF SAFE.
Agricultural Research, Vol. 21, No. 10, p. 8,
1973. 3 fig.

Descriptors: *Agricultural runoff, *Ra *Feed lots, Groundwater, Infiltration, wastes, *Farm wastes, Water pollution co Pollution abatement.

Continuing research is showing how and Great Plains cattle feedlots may contribu water pollution and is demonstrating that, adequate control of runoff, feedlots can b ceptable neighbors. In cooperation wit Nebraska Agricultural Experiment Station dies are being made of how rainfall, snow, perature, and evaporation affect pollution sloping feedlots. These studies show widespread contamination of ground water filtration from the feedlot surface is impro The research indicates that feedlots shou designed to restrict surface runoff, which transport heavy loads of pollutants. The amo solids transported in runoff may be less f feedlot than from tilled bare soil. Snowmelt may transport 10-12 times the amounts of removed in rainfall from the same feedlot, a COD will thus be correspondingly higher potential pollution hazard from a particular f can be determined only by study of the wate of which it is a part--its hydrologic characte and its proximity to surface water so (Cameron-East Central)
W76-12351

LIBRARY OF THE UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN

MAINE GUIDELINES FOR MANURE AND MANURE SLUDGE DISPOSAL ON LAND.
Maine Univ., Orono. Cooperative Extension Service.
Miscellaneous Report 142, The Life Sciences and Agricultural Experiment Station and the Cooperative Extension Service, University of Maine, Orono, 1972, 21 p. 2 fig, 11 tab.

Descriptors: *Sludge disposal, *Maine, Nitrogen, Lagoons, Irrigation, Landfills, *Farm wastes, Waste disposal, *Water quality standards, Recycling, Dehydration.
Identifiers: *Land spreading, Composting.

This standard is concerned with conditions for: (1) total recycling of nutrients through planned crop production; (2) disposing of excess manure on the land by spreading; (3) piling on the land; (4) bulk burying in landfill; (5) composting; (6) lagoon treatment with sludge and liquid disposal; (7) disposal by irrigation; and (8) dehydrated manure disposal. Maximum rates for spreading manure on land and for other methods were developed from the physical and chemical characteristics of each individual soil, and from the available knowledge of the movement of manure liquids and residues on and through each soil type. The limiting factor in determining application rate is the pounds of nitrogen per acre to be applied. An extensive table is given summarizing the permissible disposal practices and maximum manure application rates for several Maine soils. (East Central)
W76-12353

RELATING AGRICULTURAL INSTRUCTION TO ENVIRONMENT IMPROVEMENT: THE ROLE OF LAND AND SOIL,
Arizona Univ., Tucson. Dept. of Agricultural Chemistry and Soils.
V. H. Fuller.
Journal Paper No. 1854, Arizona Agricultural Experiment Station, University of Arizona, 1971, p. 9-72. 4 fig, 1 ref.

Descriptors: *Soils, *Waste disposal, *Oceans, Water pollution, *Soil contamination, Fertilizers, Soil conservation, Organic matter, Carbon dioxide, Bacteria, Nutrients, Municipal wastes, Nitrogen, Phosphorus, Sulfur, *Farm wastes, Education, *Training.
Identifiers: *Agricultural instruction, *Land disposal.

For many years warnings have been issued that man's waste disposal problem should be controlled before it gets out of hand. In the past these warnings were ignored, but today many people are working to slow down the pollution of the environment. Pollution usually ends up in either the soil or ocean. Resistance to polluting the ocean has thrown most of the burden of waste disposal on the soil. Pollution can be controlled through the soil because it is an excellent digester of wastes. The soil decomposes organic matter. It produces nitrogen and sulfur through complex microbial cycles which are initiated by organic material, and the end product of most waste is carbon dioxide, water, and humus. What is needed is knowledge of how to use these wastes to benefit the soil, and this should begin in the colleges. Courses should be developed to make people aware of the problems and the solutions. (Russell-East Central)
W76-12354

ECONOMIC EVALUATION OF LIQUID MANURE DISPOSAL SYSTEMS FOR DAIRY CATTLE,
Economic Research Service, Madison, Wis. Farm Production Economics Div.
D. D. Kimball, L. V. Lenschow, and R. E. Rieck.
Bulletin R2199, College of Agricultural and Life Science, University of Wisconsin, Madison, August, 1970, 24 p. 8 fig, 5 tab.

Descriptors: *Liquid wastes, *Waste disposal systems, *Economics, *Costs, *Dairy industry, Waste storage, Equipment, Facilities, Labor, *Wisconsin, Water pollution control, *Farm wastes, Waste treatment.

Experiences are described of Wisconsin dairy farmers who installed liquid manure disposal systems. These liquid manure systems include: (1) free-stall, all liquid (2) free-stall, liquid-conventional, (3) stanchion, all-liquid, (4) stanchion liquid-conventional. Comparisons are made of liquid manure storage, facility, investments, annual costs, and costs and returns analysis. The most economical manure-handling system depends on many variables. The net disposal costs depend upon both the value of the manure and the cost of disposing the excrement. By changing the amount on nitrogen, phosphorus, and potassium recovered and making different assumptions regarding operating and ownership costs, the optimum system of manure disposal would change. In addition, installation costs are only the out-of-pocket costs--farmers did not report a charge for their own labor. Therefore, each farmer must ask himself whether the assumptions used in this study agree with his particular situation and then interpret the results accordingly. (Merryman-East Central)
W76-12357

BEEF FEEDLOTS - A POLLUTION PROBLEM,
Agricultural Research Service, Lincoln, Neb.
C. B. Gilbertson.
Proceedings of Agriculture and Pollution Seminar, University of Arizona, Tucson, February 19, 1971, EES Series Report No. 35, p. 18-29. 5 tab, 19 ref.

Descriptors: *Feed lots, *Management, *Water pollution sources, *Air pollution, *Waste disposal, Climates, Agricultural runoff, Chemical properties, *Farm wastes, Livestock, Water pollution control, Pollution abatement.

The waste produced by the livestock feeding industry creates a pollution problem for management. The management of feedlot is affected by physical characteristics of the feedlot, climatic conditions, animal size, animal density and the type of ration fed. Livestock wastes are potential pollutants of (1) surface water, (2) ground water, (3) air, and (4) aesthetic values. Each of these problems is discussed. The primary problem in feedlot management is the need for acceptable pollution-free waste management schemes to replace waste disposal systems. An acceptance of an available method rather than research-backed recommendations is the reason for existing waste management practices. (Kehl-East Central)
W76-12358

WATER QUALITY AND WASTE DISPOSAL IN MONTANA,
Montana State Univ., Bozeman. Dept. of Botany and Microbiology.
For primary bibliographic entry see Field 5C.
W76-12359

SOIL CONSERVATION SERVICE, TEXAS TECH UNIVERSITY WORKSHOP COMMITTEE ON FEEDLOT WASTE.
Soil Conservation Service, Temple, Tex.
Soil Conservation Service, Texas Tech University Workshop Committee on Feedlot Waste, Texas Tech University, Lubbock, July 28-29, 1971, 44 p. 9 fig, 6 tab, 7 ref.

Descriptors: *Farm wastes, *Feed lots, Water quality, Water pollution, Waste disposal, Design criteria, Pollution abatement, *Waste treatment, Water pollution control.

Presentations were made dealing with the state laws and procedures for protecting Texas waters from feedlot wastes. Factors that affected the feedlot wastes and the quantity and quality of such wastes were discussed. Waste disposal methods and designs for feedlot pollution abatement systems were examined. (See W76-12364 thru W76-12368) (Kehl-East Central)
W76-12363

FACTORS AFFECTING QUALITY AND QUANTITY OF FEEDLOT WASTE COLLECTIONS,
Texas Tech Univ., Lubbock. Water Resources Center.
For primary bibliographic entry see Field 5D.
W76-12364

SOIL CONSERVATION SERVICE STANDARD AND SPECIFICATIONS FOR POLLUTION ABATEMENT MEASURES FOR CONFINED LIVESTOCK OR POULTRY FEEDING OPERATIONS,
Soil Conservation Service, Temple, Tex.
E. L. Alexander.
In: Soil Conservation Service, Texas Tech University Workshop Committee on Feedlot Waste, Texas Tech University, Lubbock, July 28-29, 1971, 10 p. 1 tab.

Descriptors: *Pollution abatement, *Confinement pens, *Livestock, *Poultry, *Regulation, *Agricultural runoff, Design criteria, Water pollution, Basins, Lagoons, *Farm wastes, Waste disposal, *Water quality standards, Waste treatment.
Identifiers: Site selection, Pollution control, Holding ponds, Land disposal.

Guidance and criteria applicable to practices and facilities for the diversion of uncontaminated off-site drainage and for the interception, settling, collecting and disposing of contaminated runoff from livestock or poultry feeding areas are presented. Criteria for the selection of a site and for the design of the feeding operation are given. (See also W76-12363) (Kehl-East Central)
W76-12367

GUIDELINES FOR HANDLING LIQUID WASTE FROM FEEDLOTS,
Texas Water Quality Board, Austin.
D. L. Pittman.
In: Soil Conservation Service, Texas Tech University Workshop Committee on Feedlot Waste, Texas Tech University, Lubbock, July 28-29, 1971, 4 p.

Descriptors: *Feed lots, *Liquid wastes, *Agricultural runoff, *Waste water disposal, *Water quality standards, Waste treatment, *Farm wastes.
Identifiers: *Solid waste disposal, Waste Control Order for Cattle Feeding Operations, Holding ponds.

The procedure for obtaining a Waste Control Order for Cattle Feeding Operations from the Texas Water Quality Board is given. Application evaluation is primarily based on pollution control measures for the following: (1) collection and retention of feeding area runoff water, (2) disposal of accumulated waste water, (3) groundwater protection from holding pond waste water seepage, and (4) disposal of accumulated solid waste. The process of obtaining a waste control order generally takes 3 months or longer. (See also W76-12363) (Kehl-East Central)
W76-12368

OUTLOOKS FOR THE FUTURE OF DEEP WELL DISPOSAL,
SCS Engineers, Reston, Va.
For primary bibliographic entry see Field 5E.
W76-12370

BASIC REMOTE SENSING INVESTIGATIONS FOR BEACH RECONNAISSANCE: AN INTERIM REPORT,
Environmental Research Inst. of Michigan, Ann Arbor.
For primary bibliographic entry see Field 2L.
W76-12375

PREDICTED OIL SLICK MOVEMENT FROM VARIOUS LOCATIONS OFF THE NEW JERSEY-DELAWARE COASTLINE,
Coast Guard Research and Development Center, Groton, Conn.
For primary bibliographic entry see Field 5B.
W76-12376

SELF-MONITORING PROCEDURES: BASIC LABORATORY SKILLS (164.6) STUDENT REFERENCE MANUAL,
Charles County Community Coll., La Plata, Md.
For primary bibliographic entry see Field 5A.
W76-12377

AN IN-SITU INVESTIGATION OF OIL BARRIER SHAPE AND DRAG COEFFICIENTS,
Rhode Island Univ., Kingston. Dept. of Ocean Engineering.
R. M. Larrabee, and G. A. Brown.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A017 099, $7.25 in paper copy, $3.00 in microfiche. U.S. Coast Guard Final Report No. USCG-D-161-75, July 1974. 201 p, 80 fig, 21 tab, 28 ref, 5 append. DOT-CG-33,962-A.

Descriptors: *Continental Shelf, *Oil pollution, *Oil spills, Resources development, *Water quality control, *Pollution abatement, *Barriers, Drag, Ocean currents, Waves(Water), *Rhode Island, Bays.
Identifiers: Outer Continental Shelf, Offshore technology, Wave action, Current action, *Oil barriers, *Narragansett Bay(RI).

In-situ experimentation on a moored 100 foot section of commercially procured oil barrier was carred out in the vicinity of the Jamestown Bridge in the West Passage of Narragansett Bay. The objectives were to study oil barrier shape and tensions as influenced by current and wave action, to analyze data on the barrier shape with existing analyses and to compare results of tension and drag coefficient data with previous investigations. Actual barrier shape was compared to a theoretical catenary drawn through the barrier end points. The shape, load, current and wave data were used to calculate various drag coefficients for the boom. Two techniques were used to calculate drag coefficients for the barrier and results of each were compared. The effects of wave action on barrier loading were determined by the analysis of two previous investigators and the results compared. Values of drag coefficient were reduced to a basic drag coefficient, independent of barrier shape configuration as well as wave effects. Results of the investigation showed that the catenary curve is a good approximation to barrier shape. The values of drag coefficients calculated indicate that a value of 1.5 to be a good approximation for the calm-water basic drag coefficient for the moored oil barrier. (Sinha-OEIS)
W76-12378

COMPARISON OF ECOLOGICAL IMPACTS OF POSTULATED OIL SPILLS AT SELECTED ALASKAN LOCATIONS. VOLUME I. INTRODUCTION, SUMMARY, METHODOLOGY, EVALUATION AND APPENDICES,
Mathematical Sciences Northwest, Inc Bellevue, Wash.
For primary bibliographic entry see Field 5C.
W76-12379

HIGH SEAS OIL CONTAINMENT BARRIER MOORING SYSTEM,
Coast Guard Research and Development Center, Groton, Conn.
K. R. Bitting.
Available from the National Technical Information Service, Springfield VA 22161 as ADA 020 980, $5.00 in paper copy, $3.00 in microfiche. Final Report No. USCG-D-176-75, July 1975. 86 p, 14 fig, 3 tab, 4 append.

Descriptors: *Continental Shelf, *Oil pollution, *Oil spills, *Pollution abatement, Water quality control, *Barriers, Water resources, Resources development.
Identifiers: *Outer Continental Shelf, *Mooring systems, *Oil containment.

The mooring system was designed, fabricated and tested to moor the Air Deployable Lightweight High Seas Oil Containment Barrier, a component of the U. S. Coast Guard's High Seas Oil Spill Response System. The key criteria to which the mooring system was buit are: (1) deliverable by HH-3 helicopter, (2) holding capacity of 8,500 pounds with 1,000 pound nominal load, (3) capability of obtaining a mooring scope of 2:1 to 3:1 in water depths of 25 to 200 feet. The system consists of an inflatably buoy, 500-pound STATO anchor, 550 feet of 7/8 diameter polyurethane-jacketed nylon line and 45 feet of 3/4 inch chain, and a delivery container. Once the mooring system has been delivered to the site by the helicopter, a small boat tows it to the location and activates the system. The delivery container is recovered by a buoy tender once the system has been deployed. Computer methods were used to size the anchor and mooring line segments that are used to construct a mooring of desired length and scope. Anchor holding power and operational sequence tests were conducted. The system weighs 2,350 pounds and has a delivery radius of 70 nautical miles as external cargo under an HH-3 helicopter. (Sinha-OEIS)
W76-12384

FAST CURRENT OIL RESPONSE SYSTEMS, TESTS ON PHASE I CONCEPTS,
Michigan Univ., Ann Arbor. Dept. of Naval Architecture and Marine Engineering.
W. P. Graebel, and V. A. Phelps.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA 022 928, $9.75 in paper copy, $3.00 in microfiche. U. S. Coast Guard Final Report No. USCG-D-20-76, April 1975. 305 p, 219 fig, 7 tab, 5 append. DOT-CG-32430-A.

Descriptors: *Instrumentation, *Oil pollution, Water quality control, *Separation techniques, *Pollution abatement, *Data processing, Testing, Test facilities, *Water pollution control, Equipment.
Identifiers: Fast current oil response systems, *Oil recovery.

Seven different concepts for fast current oil response systems were tested at the University of Michigan Fast Current Recirculating Channel. The purpose of the tests was to perform an equivalent series of tests on each device under the same environment to enable competitive comparison of the devices. This evaluation was made both quantitatively through instrumentation, and qualitatively by observation of the tests. Testing was done by University of Michigan staff with a U. S. Coast Guard officer in attendance. The device was operated by the contractor. The test program matrix included three oil viscosities, four nominal slick thicknesses, and seven current speeds. A maximum of fifty-one tests were scheduled for each device, depending on device size and capacity. The seven concepts are ranked in the order of best performance. None of the seven devices tested are near to meeting the stated goals of the Coast Guard, although they do improve present current speed capabilities by a factor of three when compared to barriers. (Sinha-OEIS)
W76-12385

EVALUATION OF MEMBRANE OIL POLL TION PREVENTION SYSTEM RESEARCH,
Daedalean Associates, Inc., Woodbine, M
Springlake Research Center
A. A. Hochrein Jr., J. D. Helm, and A. P. Thiruvengadam
Available from the National Technical Inform tion Service, Springfield, Va 22161 as AD-A0 945, $4.50 in paper copy, $3.00 in microfiche. U. Coast Guard Final Report No. USCG-D-175- August 1975. 67 p, 10 fig, 1 tab, 23 ref. DOT-C 52,312-A.

Descriptors: *Oil pollution, Water resourc Water quality control, Pollution abatement, C water, *Membranes, Coasts, Transportati Elastomers, Continental Shelf, Water pollut control, Waste water treatment.
Identifiers: Ballast tanks.

The research and engineering development eff on the membrane oil pollution prevention syst (MOPPS) conducted for U. S. Coast Guard and S. Navy is reviewed and evaluated. Scale mo tanks were used to define and evaluate proble associated with dynamic response of membr configurations under simulated operating co tions. A commercially available neoprene-ny nitrile elastomer was found to be the best mate for the membrane. Evaluation of the physical p perties of a full scale thickness material indica that the elastomer can withstand abrasion, oil mersion, creasing, wrinkling and pressure fluc tions. Preliminary results indicate little susce bility to biodeterioration. However it is belie that further study on MOPPS is not warrante the present time because of costs, operati complexity, and apparent industry acceptanc segregated clean ballast systems. (Sinha-OEIS)
W76-12388

ANALYSIS OF THE ROLE OF THE GULF TRACOASTAL WATERWAY IN TEXAS,
Texas Engineering Experiment Station, Col Station.
P. J. Shepard.
Available from the National Technical Infor tion Service, Springfield, Va 22161 as PB-247 $8.00 in paper copy, $3.00 in microfiche. Sea G Report No. TAMU-SG-75-202, December 1 246 p, numerous fig and tab, separate ref for report. 04-3-158-18.

Descriptors: *Resources development, *Te Water resources, *Environmental effe *Ecosystems, Water quality control, Dredg Waste disposal, Coasts, Transportation, Engin ing, Economics, Social impact, Legal asp Gulf of Mexico.
Identifiers: *Gulf Intracoastal Waterway(Tex)

Six tasks on various facets of the Gulf Intraco Waterway in Texas are reported. The re describe the role of the Gulf Intracoastal W way as a transportation artery and the signific of this system to the economy of Texas. The report provide baseline data on the Waterwa environmental implications, engineering asp sociological characteristics, economic imp funding alternatives, and legal consideration major thrust is an analysis of State sponsorshi maintenance and development of the Water Funding alternatives are described for State s sorship including estimated amortization and costs for varying administrative and scenarios. Supplementing the approach thorough analysis of historical and existing bearing on State sponsorship. A dominant th of the effort was to document the importan the Waterway to the people and econom Texas. This report includes findings and alt tives expressed by various researchers. (See W76-12390) (Sinha - OEIS)
W76-12389

ENVIRONMENTAL IMPLICATIONS OF MAINTENANCE AND IMPROVEMENT OF THE GULF INTRACOASTAL WATERWAY IN TEXAS,
Texas A and M Univ., College Station. Coll. of Agriculture.
R. B. Ditton, and R. L. Schmied.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-247 373, $8.00 in paper copy, $3.00 in microfiche. In: Texas A and M University Sea Grant Report No. TAMU-SG-75-202, p 11-52, December 1974. 6 fig, 3 tab, 21 ref. 04-3-158-18.

Descriptors: Water resources, *Texas, *Dredging, Environmental effects, *Water quality control, Ecosystems, Ecology, Fisheries, Nutrient, Biota, Grasses, Waste disposal, Gulf of Mexico.
Identifiers: Environmental impact, *Gulf Intracoastal Waterway(Tex).

A cursory review is given of some of the environmental considerations and impacts involved in maintenance and development of the Gulf Intracoastal Waterway. While no new primary data sources were generated, a vast amount of published material was reviewed in drafting this statement. Following a conceptual review of the environmental sub-systems contingent with the width of the GIWW, impacts associated with the maintenance and development of the Waterway are discussed and alternative means of materials disposal are analyzed. (See also W76-12389) (Sinha-OEIS)
W76-12390

USE OF THE METHOD OF MATHEMATICAL DESIGN OF EXPERIMENT IN SANITARY-CHEMICAL INVESTIGATIONS OF EPOXY COATINGS, (IN RUSSIAN),
Yuzhnoyuznyi Nauchno-Issledovatelskii Institut Gigieni i Toksikologii Pestitsidov, Kiev (USSR).
V. O. Sheftel', and V. A. Tsendrovskaya.
Gig Sanit. 10, p 66-68, 1974.

Descriptors: *Epoxy resins, *Protective coatings, Pipes, Water temperature, *Regression analysis, Water pollution control, Water pollution sources, Toxicity, Lethal limit, Organic compounds.

The effects of the 3 most essential factors on the density of migration of polyethylene-polyamine, phenylol-propane and epichlorohydrin into water from epoxy coatings of water pipes, namely, time of contact of the material with water, temperature of the water and specific surface were studied. Analysis of the regression equations allowed recommendations on the development of nontoxic formulas of epoxy coatings and their use.--Copyright 1975, Biological Abstracts, Inc.
W76-12393

RESPONSE OF WATER-HYACINTH TO LASER RADIATION,
Oral Roberts Univ., Tulsa, Okla. Dept. of Natural Sciences.
For primary bibliographic entry see Field 4A.
W76-12406

PHOSPHORESCENCE FILTER FOR OIL-WATER DISPERSIONS,
Phillips Petroleum Co., Bartlesville, Okla. (Assignee).
R. Bresson.
U.S. Patent No. 3,960,719, 3 p, 1 fig, 1 tab, 6 ref; Official Gazette of the United States Patent Office, Vol 947, No 1, p 306, June 1, 1976.

Descriptors: *Patents, *Oil pollution, *Oily water, Water pollution treatment, *Water quality control, Separation, *Coalescence, Polymers, *Separation techniques, *Dispersion, *Filters.
Identifiers: Ballast water.

A filtering media is provided for the removal of oil dispersed in a water phase such as ballast water in water tankers and bilge water from oil fired ships. A fabric made of an oleophilic, fiber-forming polymer having a high ratio of surface area to unit weight is used as the filtering medium through which is passed a mixture of oil droplets dispersed in a water phase thereby agglomerating the oil into sufficiently large drops that they will separate from the water phase to form a separate oil phase. Although a nonwoven fabric comprising a needled bat of carded fibers forms a basis for the experimental data, any method of producing a coherent fabric, such as weaving, should be suitable for the invention as long as the fabric produced has a high ratio of surface area to unit weight. The fabric will be used in multiple thicknesses in constructing a filter element. In a preferred embodiment a nonwoven fabric comprising a needled bat of carded polypropylene fibers fused on one side only and capcoated with an additional layer of polypropylene fibers needle punched into the unfused side was tested as a coalescing agent suitable for the invention. (Sinha-OEIS)
W76-12408

OIL ADSORBENT,
Idemitsu Kosan Kabushiki Kaisha (Japan). (Assignee).
M. Tomikawa, A. Tsunoda, K. Kaneda, H. Ohkawa, and Y. Mugino.
U.S. Patent No. 3,960,722, 4 p, 2 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 947, No 1, p 307, June 1, 1976.

Descriptors: *Patents, *Oil pollution, *Oily water, *Water pollution treatment, *Water quality control, *Adsorption, Industrial wastes, Oil spills, Plastics.

An oil adsorbent is provided which is capable of effectively removing oil in water, has negligible water adsorbability and is easily disposable by incineration. A resin of polyethylene series is heated at a temperature near the softening point of the resin. An inorganic calcium compound is then added to the softened resin and the mixture is homogeneously mixed and the temperature is gradually elevated. The mixing operation is finished when the temperature of the mixture has reached 130-170C. The resultant milled mixture is then cooled, solidified and crushed to a solid granular material which is then charged into a conventional foam shaping extruder where the material is heated to a melt. The melt is extruded to form a foamy substance. The foamy substance in the form of a rope is shaped into a net by knitting or weaving or by adhesion. When the network product thus shaped is used as oil adsorbent, oils are not only adsorbed to the product but also kept in the interstices. (Sinha-OEIS)
W76-12409

REMOTE SENSING OF MARINE HYDROCARBON SEEPS,
Barringer Research Ltd., Rexdale (Ontario). (Assignee).
For primary bibliographic entry see Field 5A.
W76-12411

THE EFFECT OF METHODS OF OPERATION OF AERATION BASINS ON THE DEVELOPMENT AND POPULATION DENSITY OF CULEX PIPIENS L. IN THE SOUTH OF THE RUSSIAN SFSR, (IN RUSSIAN),
Rostov Research Inst. of Medical Parasitology (USSR).
L. Y. Il'chenko.
Med Parazitol Parazit Bolezn. 43(3), p 335-341, 1974.

Descriptors: Aeration, *Sewage lagoons, *Oxidation lagoons, *Mosquitoes, Insect control, *Aerated lagoons, *Insect control, Operations, Sewage treatment.
Identifiers: *Culex-pipiens, Russian-SFSR, USSR.

In the suburbs of Novocherkassk (USSR), sewage treatment basins are mass breeding places of C. pipiens. Improper operation leads to overloading with sewage and creates favorable conditions for mass breeding of these mosquitoes. Development of the water stages of C. pipiens depended mainly on the operating regimen of these aeration basins. Certain regimens completely prevent emergence of mosquitoes and permit control of C. pipiens by sanitary-hydrotechnical measures without insecticides.--Copyright 1975, Biological Abstracts, Inc.
W76-12419

COST OF WATER POLLUTION CONTROL IN THE CARPET INDUSTRY,
Exxon Research and Engineering Co., Florham Park, N.J. Water Pollution Control Section.
B. Black, L. D. James, and E. C. Tincher.
American Dyestuff Reporter, Vol 65, No 6, p 16, 18-19, 22, 61-62, June, 1976. 5 tab, 13 ref.

Descriptors: *Textiles, *Water pollution control, *Economic impact, *Legal aspects, Legislation, Costs, Federal Water Pollution Control Act, Industrial wastes, Waste water treatment, *Water quality standards.
Identifiers: Textile industry, Carpet and rug industry.

The economic impact of effluent guidelines required by the Federal Water Pollution Control Act of 1972 on the carpet and rug industry is examined. Under the Act, carpet mills that discharge pollutants directly to the environment must install the best practicable control technology currently available by 1977 and the best technology economically achievable by 1983. The typical investment for water pollution control equipment by 1983 is expected to be between $500,000 and $1 million for a mill. The cost of producing a square yard of carpet may increase by about 2.4 cents by 1977 and by 5 cents by 1983. These increases seem too small to affect sales on the basis of available data. (Kreager-FIRL)
W76-12422

GROUND-WATER AND SURFACE-WATER RELATIONSHIPS IN THE GLACIAL PROVINCE OF NORTHERN WISCONSIN - SNAKE LAKE,
Adolph Coors Co., Golden, Colo.
N. G. Jaquet.
Ground Water, Vol. 14, No. 4, p 194-199, July-August 1976. 7 fig, 7 ref.

Descriptors: *Surface-groundwater relationships, *Wisconsin, Central U.S., *Glacial aquifers, *Subsurface flow, * Lakes, *Tracking techniques, *Eutrophication, Groundwater, Groundwater movement, Percolation, Sediments, Seepage, Lake beds, Seasonal, Limnology, Flow system, Lake stages, Unsteady flow.
Identifiers: *Lake flushing rates, *Lake rejuvenation, Northern Wisconsin, *Snake Lake(Wis), Seasonal water level fluctuations, Tracer studies.

Lake rejuvenation efforts in the Upper Midwest are important to the area's economic dependence on high-quality lakes for tourism. In developing eutrophication studies for lakes in this area, it is essential to determine the thickness of aquifer communicating with the lake, as a preliminary to calculation of the lake flushing rate. The thickness of communicating aquifer is particularly critical for lakes fed primarily by ground-water recharge, e.g., Snake Lake, Wisconsin. Through use of observation wells and chloride tracer analysis, effective aquifer thickness at Snake Lake was determined to be 30 to 50 feet. However, the local flow systems were additionally found to be highly variable through the progression of seasions. It was recommended that the possible effect of such dynamic seasonal fluctuations on the local flow

systems being considered in eutrophication studies to avoid possible improper siting of underground chemical and/or petroleum storage facilities and septic tanks in glacial deposit environments. (Prickett ISWS)
W76-12444

WATER POLLUTION CONTROL IN THE SCANDINAVIAN COUNTRIES,
National Water Board of Finland, Helsinki.
For primary bibliographic entry see Field 5D.
W76-12473

POLLUTION CONTROLS -- CONSULTANT'S ROLE,
Mason (H. C.) and Associates, Inc., Gladstone, Oreg.
H. Edel.
In: Proceedings on Wood Residue as an Energy Source, September 3-5, 1975, Denver, Colorado, Forest Products Research Society, Madison, Wisconsin, p 114-115.

Descriptors: *Pollution abatement, Water pollution control, Air pollution, Solid wastes, Legislation, Profit, Economic impact, Safety, Wastes, Industrial wastes, Water pollution sources.
Identifiers: *Forest products industry, Noise pollution.

An increasing number of pollution control problems, such as boiler emissions, water pollution, solid wastes, noise levels, etc., from forest industry production facilities are being dealt with by consulting firms. All of these control problems have had major consequences to the forest products industry since the enactment of many federal, state, and regional pollution and safety regulations. Economic consequences of meeting strict pollution regulations were given little thought initially by legislators. The pollution control problems that require help from a consultant, however, are usually the more subtle aspects for meeting the detailed requirements of particular regulations. The primary role of a consultant is to increase productivity and profits while meeting established pollution regulations. (Witt-IPC)
W76-12478

IMPLEMENTATION OF A LARGE SCALE WATER QUALITY DATA MANAGEMENT SYSTEM,
Carnegie-Mellon Univ., Pittsburgh, Pa.
W. D. Haseman, C. Holsapple, and A. B. Whinston.
Reprint No. 601. Reprint series of the Institute for Research in the Behavioral, Economic, and Management Sciences, Krannert Graduate School of Industrial Administration, Purdue University, West Lafayette, Indiana. 7 p, 4 fig, 17 ref.

Descriptors: *Water quality, *Management, *Data storage and retrieval, *Data collections, *Water pollution control, Planning, Computers, Computer programs, Behavior, Networks, Monitoring, Systems analysis.
Identifiers: *Data bases, Query language.

The development of a computer-based information system for a state Stream Pollution Control Board is examined. It is concerned with the application of the Generalized Planning System (GPLAN) to a large scale water pollution problem. This planning system, which includes both a database and a collection of application programs, has been passing through a series of modifications and extensions to make it more adaptive to its environment. Although much theoretical work has gone into the GPLAN system design, the key to its acceptance will indeed be determined by those changes, as discussed in this paper, which have been a direct result of actual implementation and use in a real life situation. (Bell-Cornell)
W76-12521

POLLUTIONAL ANALYSIS OF COMBINED SEWER SYSTEMS,
Norsk Institutt for Vannforskning, Blindern.
For primary bibliographic entry see Field 5D.
W76-12530

WATER QUALITY LAW IN FEDERAL REPUBLIC OF GERMANY,
Bonn Univ. (West Germany). Inst. fuer das Recht der Wasserwirtschft.
K. Seifert, and T. C. Lyons.
Journal of the Water Resources Planning and Management Division, Proceedings of the American Society of Civil Engineers, Vol. 102, No. WR1, p 23-33, April 1976. 1 fig, 1 tab, 10 ref.

Descriptors: Water resources, *Water law, *Water quality, *Legislation, Water pollution, Europe, *Water pollution control, Water rights, History.
Identifiers: *West Germany.

The Federal Republic of Germany (FRG) is one of the most industrialized countries in the world today with a Gross National Product exceeded only by two other nations (USA and Japan). This industrial base, as well as a population of 62,000,000, is crowded into an area of 248,000 sq km, which is about the size of the State of Oregon. Attendant with this intensive development have been the same water quality problems that plague all heavily industrialized nations. Like other countries with these environmental problems, the FRG has developed a body of laws and administrative procedures that are intended to expedite the nation's effort in environmental enhancement. This paper traces the historical development of legislation and administrative procedures in water quality law and their practicability. The paper concludes with proposals on both changes in the laws and in the methods with which water quality legislation could be implemented and administered in the FRG. (Bell-Cornell)
W76-12531

A STUDY OF RESEARCH AND DEVELOPMENT IN ENVIRONMENTAL ENGINEERING USING SYSTEM APPROACH,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
For primary bibliographic entry see Field 6B.
W76-12533

TECHNIQUES OF SIMULATION FOR HYDROLOGIC COMPUTATION, IN QUANTITY AND QUALITY, OF INTEGRATED WATER RESOURCES DEVELOPMENTS,
Office de la Recherche Scientifique et Technique Outre-Mer, Paris (France). Dept. of Fundamental Research Bureau.
For primary bibliographic entry see Field 6A.
W76-12539

APPLICATION OF MATHEMATICAL MODELLING TO WATER QUALITY FORMATION PROCESSES FOR OPERATIVE MANAGEMENT OF COMPLEX WATER RESOURCES SYSTEMS,
Vsesoyuznyi Nauchno-Issledovtelskii Institut Gidrotekhniki i Melioratsii, Moscow (USSR).
V. R. Lozansky, E. V. Eremenko, and V. P. Belogurov.
The Use of Computer Techniques and Automation for Water Resources Systems, Washington, D.C., 1974, Vol. II, p 49-52. 7 ref.

Descriptors: *Water quality, *Mathematical models, *Management, *Operations research, Water resources, Computers, Hydrodynamics, Equations, Rivers.
Identifiers: *Formation processes.

At present, water quality formation processes may be mathematically modeled in various ways. The choice of model depends on the volume of the required information, as well as upon the volum of the available initial information and on t required precision of the information obtaine Employment of any modern mathematical mod demands the application of computers and the limitations and may also influence the choice of applicable model. Herein, a river with a system water-protecting construction is investigated, co siderable involvement and space distribution a the usual characteristics, as well as a large numb of natural and man-made factors influencing t processes of the river water quality formation multitude of uncontrollable disturbances, t limited possibilities of operative effects, and large number of interacting regulators. Consider are two principally different approaches to mo construction: the analytical and the synthetic. I operative control in complex systems of wa resources it is possible to apply mathemati models constructed on the basis of both metho A model for each specific case should be cho according to the peculiarities of the subject, required information, and the computer capaci (See also W76-12535) (Bell-Cornell)
W76-12547

EXPERIENCES WITH MATHEMATIC MODELS USED FOR WATER QUALITY A QUANTITY PROBLEMS,
Rijkswaterstaat, The Hague(Netherlands), D Processing Div.
For primary bibliographic entry see Field 6A.
W76-12548

THE UNITED STATES ENVIRONMENT PROTECTION AGENCY'S STORM WAT MANAGEMENT MODEL,
Environmental Protection Agency, Washingt D.C. Office of Research and Monitoring.
H. G. Torno.
In: The Use of Computer Techniques and A mation for Water Resources Systems, Wash ton, D.C., April, 1974, Vol. II, p 88-91.

Descriptors: *Environmental engineering, *W pollution control, *Storm water, *Managem *Mathematical models, Urban runoff, Simula analysis, Computers, Systems analysis.
Identifiers: *Storm Water Management Model.

Recent investigations have revealed that st water discharges and combined sewer overfl are major sources of urban water pollution. obvious that construction of separate storm sanitary sewers is not the solution, and it is equ infeasible to construct treatment plants capabl treating the peak flows generated in a comb system. The development of the digital comp has made complex mathematical models wi available to the engineer, and such an approa ideally suited to the examination of storm combined sewer overflow pollution abatemen ternatives. The EPA's Storm Water Manage Model (SWMM) is a comprehensive mode urban hydrological phenomena. It uses the rai and system characteristics as inputs, determ quantity and quality of runoff, routes this ru through a combined sewer system with spec storage and treatment facilities and operating cies and thence into receiving waters, where impacts are identified. This article describes model, lists its applications, and discusses ne modifications for its future development and plication to assist in the design of pollution co facilities. (See also W76-12535) (Bell-Cornell)
W76-12549

THE APPLICATION OF MATHEMATI MODELS AND OPTIMIZATION TECHNIQ IN PLANNING WATER SUPPLY AND WA WATER DISPOSAL SYSTEMS,
Michigan Univ., Ann Arbor. Dept. of Env mental and Industrial Health.
For primary bibliographic entry see Field 6A.
W76-12560

UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN

LABORATION AND USE OF A MATHEMATI-AL MODEL TO FORECAST IN QUANTITY ND QUALITY, THE WATER DEMANDS OF ARIOUS SECTORS OF INDUSTRY,
ociete du Canal de Provence et d'Amenagement la Region Provencale Le Tholonet, Aix-en-rovence (France).
or primary bibliographic entry see Field 6D.
76-12562

ENEFIT COST ANALYSIS--A NECESSARY ART OF ENVIRONMENTAL DECISIONING,
innesota Univ., Duluth. Dept. of Economics.
or primary bibliographic entry see Field 6G.
76-12576

NOTHER VIEW OF OFFSHORE OIL AND AS OPERATIONS.
arine Technology Society Journal Vol 8, No 9, p 2, October/November 1974. 34 ref.

escriptors: *Environmental effects, *Resources velopment, *Water quality control, Water ources, Continental Shelf, Oil, Gases, Assess-nt, Leases, Ecology, Drilling.
ntifiers: *Outer Continental Shelf, *Offshore hnology, *Environmental impact, *Offshore ling.

e report 'OCS Oil and Gas - an Environmental sessment,' was examined by a committee of the tional Academy of Sciences. Excerpts from the mittee's findings about the CEQ report and issues, both technical and of public policy are sented. While the Council on Environmental ality (CEQ) Report is a responsive advisory ement on future environmental policies regard-OCS oil and gas, the committee wishes to ss the study's limited mandate as well as its un-standable avoidance of consideration of alter-ves to our current national energy policy. The ort accepts OCS development as an exclusive vity of the private sector without examining ous legislative proposals for a federal oil elopment corporation or for other public elopment entities such as exist in other coun- that produce oil and gas. Finally, the report s on the precept that continued annual growth ergy availability to the year 2000 and beyond cepted public policy. The committee believes these assumptions should be challenged by all erned with the development of a viable, long- national energy policy. The committee mmends that a vigorous effort be initiated to nd knowledge of the physical and biological ronments and the ecological systems likely to ffected. Ecological studies of an area that t be affected by OCS development should be ucted while plans are developing for explora-and engineering, so that the possible effects e evaluated before significant impacts occur. a - OEIS)
12577

APPROACH TO THE SUPER-T/REFINERY QUESTION,
s Coastal and Marine Council, Galveston.
Moseley, and J. Frucht.
ne Technology Society Journal, Vol 8, No 8, September 1974.

riptors: *Continental Shelf, *Resources opment, *Oil industry, Water resources, *Oil ion, *Water quality control, *Environments, ts, Management, Planning, Ports, Coasts, England, New Hampshire.
fiers: *Outer Continental Shelf, rports, Refineries, Deepwater ports, En-nental impact.

f discussion is presented on the controver-sues on the construction of deepwater ports ports) and the required oil refineries. It was ted before a New England conference on ubject held at the University of New Hampshire. The authors make the following suggestions: Realize that a large deepwater port and/or refinery complex is a permanent irreversible commitment; Learn something about the oil business--something other than Exxon ads and Common Cause press releases; Realize the difference between evolutionary and revolutionary actions/impacts in the context of DWPs and refineries; Realize that even in Texas, the oil and chemical industry doesn't own all politicians; Realize that credibility is usually proportional to size; Realize the magniture of the stakes involved; Consider a DWP/refinery and Outer Continental Shelf oil and gas development as related issues; Do not believe the promises and/or threats of promoters and hysteria peddlers; Do not act hastily nor finally with either closed or open arms; Do not naively believe that things can be completely controlled once development starts, and Do not become confused by lawyers (or engineers, or planners, or ecologists, or etc.) debating the finer points of facility siting/regulatory legislation and lose sight of the major public policy issues. On the issue of deepwater ports and refineries the private citizen's responsibilities include: seeing that all the appropriate issues are raised and revealing questions asked, pressing elected/appointed officials to thoroughly pursue the matter, and insisting on full and accurate disclosure by all included parties. (Sinha - OEIS)
W76-12578

DEVELOPMENT OF RESIDUALS MANAGEMENT STRATEGIES,
Indiana Univ., Bloomington. School of Public and Environmental Affairs.
C. N. Ehler, R. S. Howe, and N. White.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-251 012, $5.00 in paper copy, $3.00 in microfiche. Environmental Protection Agency, Report EPA-600/1-76-01/B, January 1976. 82 p, 6 fig, 5 tab, 3 append. R-803313-01-1.

Descriptors: *Waste disposal, *Decision making, *Planning, *Non-structural alternatives, *Water management(Applied), Pollution abatement, Water quality, Alternative planning, Institutions, Environment.
Identifiers: *Residuals, Residuals generation and discharge model, Residuals management strategies, Implementation, Physical methods.

Based on the premise that human activity generates and discharges waste residuals, a residuals generation and discharge model is proposed to achieve governmental standards of environmental quality. The residuals management model identifies various points in the residuals generation and discharge process where intervention with physical methods can reduce or alleviate the effect of residual wastes on the environment The physical methods are supplemented by implementation measures (non-structural actions such as laws, regulations and ordinances) and institutional arrangements (public organizations which establish goals and objectives, select and enforce physical methods, and adopt implementation measures) to form a residuals management strategy. Recommendations are: (1) use residuals generation and discharge model in the planning process; (2) the planning process for reviewing alternative residuals management strategies should start without considering legal, political, technological or social constraints; (3) all reasonable alternatives should be considered by decision makers; (4) the residuals generation and discharge model could serve as a common base for consumers, labor, business and government groups concerned with planning for environmental quality. (Gentry-North Carolina)
W76-12581

A METHODOLOGY TO MEASURE THE PERFORMANCE OF THE EPA REGIONAL EIS REVIEW PROCESS,
Argonne National Lab., Ill. Energy and Environmental Studies Div.
For primary bibliographic entry see Field 6G.
W76-12583

REPORT OF THE QU'APPELLE BASIN STUDY BOARD.
Saskatchewan Quappelle Basin Study Board, Regina.
October 1972. 92 p, 50 fig, 17 tab, 3 plates, 34 ref.

Descriptors: *Water quality, Water management, *Land use, Water resources, *Watershed protection, *Water supply, *Flood protection, *Canada, Algae, Planning, Agriculture, Institutions, Waste water treatment, Water use, River basins, *Saskatchewan.
Identifiers: *Qu'Appelle River Basin, Moose Jaw(Saskatchewan), Regina(Saskatchewan), Buffalo Pound Lake(Saskatchewan).

A comprehensive framework plan to develop and manage the water and related land resource of the Qu'Appelle Basin for social betterment and economic growth is presented. It was prepared by collecting basic data, determining planning objectives, analysing and evaluating alternatives, and finally, preparing the plan. The basin, which is a flat or gently undulating treeless plain, contains 20,000 square miles and is cut by the Qu'Appelle River Valley through its entire length to a depth of 100 to 300 feet. Population, currently at 280,000, will reach 320,000 by the year 2000. Continued urbanization in the basin is expected. Problems include algae blooms, flooding in urban areas, poor public access to lake shores in places, and possible water supple difficulities in the future. The plan contributes to a number of objectives: water supply and quality; industrial development public health; flood protection; recreation; wildlife; etc. Recommendations are presented in 5 categories; water quality; water supply; land and water surface use; adjustment to flood hazard; and general. Some recommendations for water quality are: specific objectives for water quality should be established; higher levels of treatment should be provided in Regina and Moose Jaw; agricultural practices in the basin should be controlled; regulations for waste disposal should be implemented; and water quality should be monitored. Recommendations with similar scope are given in the other areas. Recommendations on public participation, institutions, education, construction standards, and ownership are discussed in the general category. (Smith - North Carolina)
W76-12587

WATER QUALITY OBJECTIVES.
Environmental Protection Service, Regina (Saskatchewan). Water Pollution Control Branch. January 1975. 16 p, 6 tab, append.

Descriptors: *Water quality, *Water quality standards, *Pollution, Water resources, *Water management, *Saskatchewan, Surface waters, Groundwater, Algae, Municipal water, Sewage treatment.
Identifiers: *Water quality objectives, Private water supply.

This listing of specific objectives pertains mainly to surface water, but deals to a small degree with ground water resources. The management objective of this agency is to conserve and protect water resource and to maintain and improve its quality for public protection, within economic limits. This serves the following purposes: protection of water supplies; encouragement of economic development; preservation of wildlife. The guidelines and objectives ennumerated here are not meant to be rigid, but serve as guides. Each case of waste disposal and water pollution is looked at on its own merits while considering a broader water quality

management point of view. The general objectives for effluent discharges are that such discharges should be: free from toxic or potential toxic substances; free from substances that will form objectionable sludge; free from debris, oil, etc. that would be noticeable in receiving waters; free from color, turbidity, or odour-producing materials that would have certain effects; and free from nutrient that would create nuisance growths. Specific objectives are given for: surface water, algae and acquatic nuisances, municipal drinking water, ground water quality, guidelines for private water supplies, and guidelines for sewage treatment. Objectives are given both as numbers and more general statements. An appendix explains 43 separate parameters used to measure water quality. (Smith - North Carolina)
W76-12588

USE OF EMERGENCE DATA FOR ESTIMATING ANNUAL PRODUCTION OF AQUATIC INSECTS,
Oregon State Univ., Corvallis. Dept. of Entomology.
For primary bibliographic entry see Field 2I.
W76-12597

A SURVEY OF PHOSPHORUS REMOVAL IN WISCONSIN,
Howard, Needles, Tammen and Bergendoff, Milwaukee, Wis.
For primary bibliographic entry see Field 5D.
W76-12649

U.S. ARMY MOBILITY EQUIPMENT RESEARCH AND DEVELOPMENT COMMAND ENVIRONMENTAL POLLUTION ABATEMENT PROGRAM,
For primary bibliographic entry see Field 5D.
W76-12651

WASTEWATER RESOURCES IN NORTH CENTRAL TEXAS,
Camp, Dresser and McKee, Inc., Boston, Mass.
D. R. Horsefield, and J. D. Goff.
American Water Works Association Journal, Vol. 68, No. 7, p 357-359, July, 1976.

Descriptors: *Water reuse, *Reclamation, *Reclaimed water, *Municipal wastes, *Cooling water, *Electric power industry, Treatment facilities, Water requirements, *Texas, Symbiosis.

The feasibility and desirability of waste water reclamation in North Central Texas are discussed. A review of various water reuse alternatives for the area indicates that the steam electric power industry is a potentially large user of reclaimed waste water. Cooling water requirements for the 11 major power plants in North Central Texas amount to an estimated 56 million gallons/day based on the present utilization of cooling towers and lakes, and water requirements are expected to more than double within the next 10 years. By the year 2000, water requirements based on existing cooling technology are expected to be a major problem for the power industry. Thus, the locating of new power plants near municipal waste water facilities so that high quality effluent can be used for cooling towers is recommended. (Kreager-FIRL)
W76-12652

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

OPTIMIZATION OF REAL TIME DAILY OPERATION OF A MULTIPLE RESERVOIR SYSTEM,
California Univ., Los Angeles. Dept. of Engineering Systems.
For primary bibliographic entry see Field 4A.
W76-12155

PLANNING THE LOCATION AND CAPACITY OF FLOOD CONTROL STRUCTURES,
Cornell Univ., Ithaca, N. Y. Coll. of Engineering.
For primary bibliographic entry see Field 4A.
W76-12156

WABASH RIVER SYSTEMS MODEL - TERMINAL REPORT PHASE I,
Purdue Univ., Lafayette, Ind. School of Civil Engineering.
For primary bibliographic entry see Field 4A.
W76-12220

AVAILABILITY OF GROUND WATER NEAR CARMEL, HAMILTON AND MARION COUNTIES, INDIANA,
Geological Survey, Indianapolis, Ind.
D. C. Gillies.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 224, $4.00 in paper copy, $3.00 in microfiche. Water-Resources Investigations 76-46, May 1976. 27 p, 10 fig, 2 tab, 7 ref.

Descriptors: *Groundwater resources, *Projections, *Water supply, *Aquifer characteristics, *Hydrogeology, Data collections, Test wells, Water yield, Regression analysis, Computer models, Transmissivity, Storage coefficient, Groundwater recharge, Pumping, Seepage, Water levels, Observation wells, *Indiana.
Identifiers: Carmel area(Ind).

A study of the hydraulic characteristics of the unconsolidated glacial deposits near the city of Carmel in central Indiana shows that 21.3 million gallons per day (mgd) of additional water could be withdrawn from the aquifer for an indefinite period of time. This pumpage is approximately 5 mgd above the projected water needs of Carmel for 1990. Saturated thickness, transmissivity, and storage coefficient of the outwash aquifer along the White River east of Carmel were determined, using available data supplemented by test drilling. The saturated thickness of the aquifer ranges from 10 to 110 feet; transmissivity ranges from 1,000 to 24,000 feet squared per day; and the average storage coefficient is 0.11. Seepage from the aquifer into the White River was estimated in November 1974, using data from U.S. Geological Survey gaging stations. Water-level information was obtained from a network of observation wells at that same time. A digital-computer model was used to estimate the rate of withdrawal that might be sustained from the aquifer and the effect of that withdrawal. The predicted average reduction of the flow of the White River is 21.3 mgd in the study area. To develop the fullest potential of the aquifer and to maintain reasonable pumping rates, pumping wells should be located as near to the river as possible and where the aquifer saturated thickness equals or exceeds 50 feet. (Woodard-USGS)
W76-12287

ECONOMIC UNCERTAINTIES IN WATER RESOURCES PROJECT DESIGN,
Eotovs Lorand Univ., Budapest(Hungary).
F. Szidarovszky, I. Bogardi, L. Duckstein, and D. Davis.
Water Resources Research, Vol. 12, No. 4, p 57[illegible] 580, August 1976. 3 fig, 4 tab, 21 ref, 1 append

Descriptors: *Water resources, *Projec[illegible] *Design, *Economics, Decision making, Equ[illegible] tions, Simulation analysis, Monte Carlo metho[illegible] Methodology, Systems analysis, Hydrolo[illegible] aspects, Flood protection, Levees, Constructi[illegible] costs, Benefits, Height, Optimization, Mathema[illegible] cal models, *Risks.
Identifiers: *Economic uncertainty programmi[illegible] Benefit maximization, Flood losses, Sensitivi[illegible] Error correlation.

Economic uncertainty programing (Ecup) is[illegible] method which enables decision makers to analy[illegible] economic uncertainties separately from hydrol[illegible] ic uncertainties in the design of water resour[illegible] systems. Ecup distinguishes between econo[illegible] and hydrologic variables in the expression o[illegible] payoff or objective function. The economic va[illegible] bles, assumed to have been estimated at discr[illegible] points only, are treated as random variables[illegible] postulated joint probability distribution of th[illegible] variables is used to estimate by Monte Carlo si[illegible] lation the distribution of payoff resulting fro[illegible] project. The worth of perfect information or [illegible] pected opportunity loss is calculated. In a c[illegible] study, the problem of choosing among flood p[illegible] tection levees of different heights is examin[illegible] The random economic factors considered are [illegible] flood losses and construction costs. The sensit[illegible] ty to various degrees of error correlation and [illegible] uncertainty is analyzed. It is found that a relati[illegible] small uncertainty in the economic estimates of[illegible] payoff function may cause considerable varia[illegible] in both the distribution of benefits to be expe[illegible] from a levee and the height of the optimal le[illegible] (Bell-Cornell)
W76-12514

INTERDISCIPLINARY MODELS OF WA[illegible] SYSTEMS,
Central and Southern Florida Flood Control [illegible] trict, West Palm Beach.
A. N. Shahane.
Ecological Modelling (International Journal [illegible] Ecological Modelling and Engineering [illegible] Systems Ecology) Vol. 2, No. 2, p 117-145, [illegible] 1976. 3 fig, 36 ref.

Descriptors: Water resources, *Ecol[illegible] *Mathematical models, Economics, Poli[illegible] aspects, Social aspects, Technology, Env[illegible] ment, Water quality, Methodology, Hydrau[illegible] Hydrology, Optimization, Simulation anal[illegible] Equations, Systems analysis, *Model studies.
Identifiers: *Interdisciplinary models, W[illegible] systems, Time series.

To evaluate the complex interactions of va[illegible] types of water systems, a water resource ma[illegible] ment agency is invariably involved in the pre[illegible] nary step of reviewing the available quantit[illegible] methods for formulating interdisciplinary as[illegible] of the water systems. With a view to supple[illegible] their efforts, an attempt is made herein to re[illegible] briefly the major useful concepts and m[illegible] which are intended to broaden the tech[illegible] horizon of the professionals associated wit[illegible] regional water resource management prog[illegible] Initially, various pathways of model bu[illegible] procedure are outlined. Then associated ec[illegible] cal, economic, social, political, technologica[illegible] environmental models are discussed in lig[illegible] some reported quantitative examples. With th[illegible] derstanding of the basic mechanics of these [illegible] disciplinary models, the adequacy of these m[illegible] and their applications can be examined by the[illegible] cerned professionals to aid the decision m[illegible] process for the specific water system in que[illegible] (Bell-Cornell)
W76-12516

DYNAMIC REGIONAL MODEL FOR ALUATING RESOURCE DEVELOPMENT OGRAMS,
nitoba Univ., Winnipeg. Dept. of Agricultural onomics.
primary bibliographic entry see Field 4A.
6-12520

PLEMENTATION OF A LARGE SCALE TER QUALITY DATA MANAGEMENT TEM,
negie-Mellon Univ., Pittsburgh, Pa.
primary bibliographic entry see Field 5G.
5-12521

TER SUPPLIES FROM ULSTER VALLEY AVELS,
itute of Geological Sciences, London gland). Dept. of Hydrogeology.
primary bibliographic entry see Field 4B.
-12524

IMIZATION OF DESIGN CAPACITY OF AQUEDUCT,
fornia Univ., Berkeley. Lawrence Berkeley

primary bibliographic entry see Field 4A.
-12526

ESIAN APPROACH TO TILE DRAIN IGN,
e Polytechnique Federale de Lausanne tzerland). Dept. of Agriculture.
primary bibliographic entry see Field 8B.
12527

NTITATIVE ASSESSMENT OF ENVIRON-TAL IMPACT,
ns (Ralph M.) Co., Pasadena, Calif. Systems

rimary bibliographic entry see Field 6G.
12528

TUDY OF RESEARCH AND DEVELOP-T IN ENVIRONMENTAL ENGINEERING G SYSTEM APPROACH,
ational Inst. for Applied Systems Analysis, burg (Austria).
imary bibliographic entry see Field 6B.
2533

UATING TISZA RIVER BASIN LOPMENT PLANS USING MULTIAT-TE UTILITY THEORY,
ational Inst. for Applied Systems Analysis, burg (Austria).
imary bibliographic entry see Field 4A.
2534

USE OF COMPUTER TECHNIQUES AND MATION FOR WATER RESOURCES EMS.
mic Commission for Europe (UN), New Committee on Water Problems, Economic cial Council.
dings of a Symposium organized by the ttee on Water Problems of the United Na- Economic Commission for Europe, gton, D.C., March-April 1974. 186 p, 41 fig, 01 ref.

tors: *Water resources development, ters, *Automation, *Management, dology, *Planning, *Optimization, ation analysis, Economics, Social aspects, asins, Reservoirs, Water quality, Water Mathematical models, Systems analysis, water, Hydrology, Waste water treatment, n making, Equations.
ers: Cost minimization.

Presented are thirty-three discussion papers dealing with the use of computer techniques and automation to facilitate water resources development planning and management. Many of the articles present case studies to illustrate the application of a proposed methodology, i.e., simulation and/or optimization techniques. Participating countries include the United States, France, Great Britain, West Germany, Russia, the Netherlands, Romania, Finland, and Hungary. The papers are organized under the following three principle topics: (1) general objectives of the use of computer techniques and automation for water resources systems; (2) water quality and quality models for planning; and (3) socio-economic models for planning. The symposium as a whole supports the use of computerized methods to aid in the solution of national and regional complex, comprehensive water planning and management problems. (See W76-12536 thru W76-12567) (Bell-Cornell)
W76-12535

PRESENT SITUATION AND TRENDS IN THE APPLICATION OF ADVANCED METHODS AND TECHNIQUES FOR WATER RESOURCES MANAGEMENT.
Economic Commission for Europe (UN), New York.
For primary bibliographic entry see Field 7C.
W76-12536

PROFESSIONAL REQUIREMENTS OF MODERN WATER ENGINEERS INVOLVED IN RIVER BASIN MANAGEMENT UTILIZING CONTEMPORARY TOOLS,
Bureau of Reclamation, Sacramento, Calif. Mid-Pacific Regional Office.
For primary bibliographic entry see Field 4A.
W76-12537

OPTIONS OF DEVELOPMENT AND INTEGRATED MANAGEMENT OF WATER RESOURCES,
Ecole Nationale Superieure des Mines de Paris, Fontaine-bleau (France). Center for Geological Information.
For primary bibliographic entry see Field 6B.
W76-12538

TECHNIQUES OF SIMULATION FOR HYDROLOGIC COMPUTATION, IN QUANTITY AND QUALITY, OF INTEGRATED WATER RESOURCES DEVELOPMENTS,
Office de la Recherche Scientifique et Technique Outre-Mer, Paris (France). Dept. of Fundamental Research Bureau.
M. Roche.
In: The Use of Computer Techniques and Automation for Water Resources Systems, Washington, D.C. 1974, Volume II, p 16-19.

Descriptors: *Water resources development, *Simulation analysis, Water quality, Hydrology, Operations, Projects, Hydrologic data, Mathematical models, Time, Hydraulics, Water supply.

In a broad sense, any equipment and organization aimed at satisfying water demands in quantity and quality, satisfying power demands, and protecting man, his environment and his production tools against flood damage and pollution may be considered as a water resources project. When the study concerns a one-structure project, aimed at satisfying only one demand, i is often possible to make estimations with simplified methods, although even in this case using mathematical models may be very useful. For projects involving several structures, various sources of water and multiple uses, it becomes quite impossible to process without using sophisticated methods. Simulation of operating management is then one of the methods which may be used. This article discusses the principle of simulation and describes a water system and its operation. Considered also are the organization of a model for simulation (programme) and input data and their statement. (See also W76-12535) (Bell-Cornell)
W76-12539

USE OF SIMULATION MODELS FOR THE EVALUATION OF A REGIONAL WATER-RESOURCE SYSTEM,
Water Resources Board, Reading (England).
D. G. Jamieson.
In: The Use of Computer Techniques and Automation for Water Resources Systems, Washington, D.C., 1974, Volume II, p 19-23. 1 fig, 5 ref.

Descriptors: *Water resources development, *Simulation analysis, *Regional analysis, Evaluation, Mathematical models, Optimization, *Planning, *Design, Reservoir storage, Computers, Computer programs, Water supply, Water quality, Systems analysis, Flow.
Identifiers: Storage capacity, Synthetic flow data.

In the United Kingdom, piecemeal promotion of new reservoir schemes by local authorities is being superseded by planned development of water resource systems on both a regional and national basis. Each new addition of storage is now considered as an element of a much larger system and must be assessed in conjunction with other existing and proposed storages in that system. Planning models have been formulated for purposes of identifying a limited number of near-optimal least-cost solutions for satisfying the forecast water demands. But since planning models are restricted to using simple evaluation routines, the assumptions made in deriving the near-optimal solutions need substantiating. This process is referred to as the design stage, its purpose being to define the storage capacity and pump sizes of each new element in order to meet the water demands on the total system and any water quality constraints with a given acceptable reliability. This paper considers the design stage of water resource planning; discussed are traditional techniques, simulation of water quantity, simulation of water quality, and optimization. (See also W76-12535) (Bell-Cornell)
W76-12540

APPLICATION OF DYNAMIC PROGRAMMING IN FRAMING OPERATING RULES FOR A MULTI-PURPOSE DAM,
Societe Grenobloise d' Etude et d' Applications Hydrauliques (France).
For primary bibliographic entry see Field 4A.
W76-12541

DYNAMIC PROGRAMMING FOR DETERMINATION OF A STORM WATER OUTLET SYSTEM OF PIPES AND FLOOD-DAMPING DAMS,
Societe Grenobloise d'Etude et d' Applications Hydrauliques (France).
For primary bibliographic entry see Field 4A.
W76-12542

INTEGRATED MATHEMATICAL MODELS USED FOR GROUNDWATER RESOURCES PLANNING IN AREAS INFLUENCED BY HUMAN SETTLEMENTS,.
Technische Universitaet, Hanover,(West Germany). Institut fuer Wasserwirtschaft, Hydrologie und Landwirtschaftlichen Wasserbau.
For primary bibliographic entry see Field 4B.
W76-12543

OPTIMIZATION OF GROUNDWATER WITHDRAWALS WITH REGARD TO TECHNICAL AND HYDROLOGICAL CONSTRAINTS,
Technische Universitaet, Hanover (West Germany). Institut fuer Wasserwirtschaft, Hydrologie und Landwirtschaftlichen Wasserbau.
For primary bibliographic entry see Field 4B.
W76-12544

INFLUENCE OF SPECIAL CONSTRUCTIONS IN REGIONAL WASTE WATER SYSTEMS AND THEIR ROLE IN MATHEMATICAL MODELS FOR PLANNING.
Karlsruhe Univ. (West Germany). Institut fuer Hydromechanik, Staunanlagen und Wasserversorgung.
For primary bibliographic entry see Field 5D.
W76-12545

A QUANTITATIVE MODEL FOR THE PLANNING OF SURFACE WATER RESOURCES: USE OF MIXED VARIABLE LINEAR PROGRAMMING,
Ardour-Garonne Agency, Toulouse (France), Programming Group.
For primary bibliographic entry see Field 4A.
W76-12546

APPLICATION OF MATHEMATICAL MODELLING TO WATER QUALITY FORMATION PROCESSES FOR OPERATIVE MANAGEMENT OF COMPLEX WATER RESOURCES SYSTEMS,
Vsesoyuznyi Nauchno-Issledovtelskii Institut Gidrotekhniki i Melioratsii, Moscow (USSR).
For primary bibliographic entry see Field 5G.
W76-12547

EXPERIENCES WITH MATHEMATICAL MODELS USED FOR WATER QUALITY AND QUANTITY PROBLEMS,
Rijkswaterstaat, The Hague(Netherlands), Data Processing Div.
J. Voogt, and C. B. Vreugdenhil.
In: The Use of Computer Techniques and Automation for Water Resources Systems, Washington, D.C., April 1974, Vol. II, p 52-87. 22 fig, 21 ref.

Descriptors: *Model studies, Water resources, *Water quality, Computers, *Methodology, Management, Drainage, Networks, Discharge(Water), Cooling water, Waste water(Pollution), Estuaries, Storage, Systems analysis, Water supply.
Identifiers: Morphological aspects.

The use of models of whatever kind is prompted by the fact that they enable us to study and understand processes under existing or future conditions without interfering with the actual prototype situation. Presented is a detailed, comprehensive study of the use of mathematical modeling to solve water quality and quantity problems. Considered are computational methods, including one- and two-dimensional models. A number of one-dimensional problems is discussed: (1) water management in drainage networks; (2) water management in the Delta (Netherlands) region; (3) high discharges along the Rhine branches; (4) cooling water circulation; (5) water quality in storage basins; and (6) waste water in estuaries. Two-dimensional problems studied are: (1) waste concentrations on the coast; (2) waste water in estuaries; and (3) steady flow in lakes. Discussed finally are morphological aspects. In conclusion, in many cases it is possible to obtain reasonable results with fairly simple tools. A major drawback is that many models contain some empirical parameters which must be determined anew for each new application. (See also W76-12535) (Bell-Cornell)
W76-12548

THE UNITED STATES ENVIRONMENTAL PROTECTION AGENCY'S STORM WATER MANAGEMENT MODEL,
Environmental Protection Agency, Washington, D.C. Office of Research and Monitoring.
For primary bibliographic entry see Field 5G.
W76-12549

RIVER SYSTEM MODELLING FOR OPERATIONAL FORECASTING,
National Weather Service, Silver Spring, Md. Hydrologic Research and Development Lab.
For primary bibliographic entry see Field 4A.
W76-12550

SYSTEMS SIMULATION AS A TOOL FOR WATER RESOURCE PLANNING, INCLUDING QUALITATIVE ASPECTS,
Bureau of Reclamation, Denver, Colo. Research and Engineering Center.
For primary bibliographic entry see Field 4A.
W76-12551

THE SOLUTION OF THE REGIONALIZATION PROBLEM BY CERTAIN BRANCH-AND-BOUND METHODS,
Karlsruhe Univ. (West Germany). Institut fuer Hydromechanik, Staunanlegen und Wasserversorgung.
For primary bibliographic entry see Field 5D.
W76-12552

SURFACE WATER AND GROUND WATER INTERACTION PHENOMENA IN PLANNING MODELS,
Geological Survey, Washington, D. C.
For primary bibliographic entry see Field 4B.
W76-12553

MATHEMATICAL SIMULATION AND OPTIMIZATION OF FLOOD CONTROL SYSTEMS,
Belorusskii Central Research Inst. for Water Resources, Minsk.
For primary bibliographic entry see Field 4A.
W76-12554

SIMULATION MODEL OF THE QUANTITATIVE AND QUALITATIVE EVOLUTION OF WATER RESOURCES AT DIFFERENT POINTS OF A RIVER-BASIN (ORNE),
Financial Agency of the Basin 'Seine-Normandie', Paris(France). Water Resources Div.
For primary bibliographic entry see Field 4A.
W76-12555

THE 'POLPOLE' MODEL: AN ATTEMPT TO ANALYSE THE WATER SYSTEM IN THE FINANCIAL AGENCY OF A FRENCH RIVER BASIN,
Financial Agency of the Basin 'Seine-Normandie', Paris (France).
For primary bibliographic entry see Field 4A.
W76-12556

USE OF INVESTMENT MODELS FOR THE LONG-TERM PLANNING OF A WATER RESOURCE SYSTEM FOR ENGLAND AND WALES,
Water Resources Board, Reading (England).
K. F. Clarke.
In: The Use of Computer Techniques and Automation for Water Resources Systems, Washington, D.C., April 1974, Vol. II, p 137-143. 1 fig, 3 ref.

Descriptors: *Water resources development, *Long-term planning, *Investment, *Alternative planning, *Simulation analysis, Computers, Computer programs, Analytical techniques, Mathematical models, Optimization, Linear programming, Constraints, Economics, Water demand, Systems analysis.
Identifiers: *England, *Wales, Integer programming, Cost minimization.

The geographical and temporal distribution of rainfall in England and Wales causes a problem of water conservation and creates the need for a comprehensive strategy of water resources development. This article describes a modeling methodology for determining an economically optimal development, including the capital investment decision of which resources to develop and the decision of which demand centers to supply. Using integer programming, the first model provides a full search of the alternative development programs and minimizes the objective function. Then a simulation model, based on a suite of programs, computes annual water allocations and a detailed breakdown of costs. The six basic stages in the simulation model analysis are outlined. Included is the determination of the optimal plan of the staging and sizing of pipe and pumps. The maximum flow is used to size the plant and the average flow is used in computing the running costs. The final stage computes the total annual incidence of costs and discounted costs. (See also W76-12535) (Bell-Cornell)
W76-12557

USE OF OPTIMIZATION MODELS FOR WATER RESOURCES ALLOCATION AND CHOICE OF INVESTMENTS BY MEANS OF COMPUTERS,
Research and Design Inst. for Water Resources Engineering, Bucharest (Rumania). Water Economy Section.
C. Parvulescu.
In: The Use of Computer Techniques and Automation for Water Resources Systems, Washington, D.C., April 1974, Vol. II, p 144-150. 4 fig, ref.

Descriptors: *Water resources development, *Methodology, *Water allocation(Policy), *Planning, Optimization, Investment, Computers, Economics, Hydrologic aspects, Dynamic programming, Simulation analysis, Equations, Systems analysis.
Identifiers: Cost minimization.

Presented is a method for water resources development planning and allocation intended to eliminate as much as possible the drawbacks of existing methods. Given the growing complexity of water management problems, most methods are insufficient. Existing methods artificially divide into fragments the unitary character both of water utilization phenomena and water resources development systems. Moreover, problems of quality and quantity are approached separately. Not enough consideration is given the interrelationship between the internal expenses of water users and the external expenses of water resources developmet works. Assumptions and principles of the proposed method are given. Considered are the elements and relationships regarding technological and economical aspects of water utilization by each user. Using the new methodology, optimization of the dimensioning and operation elements of a water system is considered. The optimization criterion is to minimize system costs. Utilized are dynamic programming and simulation analysis. Advantages of the method include: the possibility of establishing the transition mode from the natural flow regime to the developed flow regime of the source; and allowance for a judicious calculus of penalties that must be paid by water users that deviate from optimal strategy of system dimensioning or operation. (See also W76-12535) (Bell-Cornell)
W76-12558

TASAM, A METHOD FOR SETTING GOALS, EVALUATING AND COMPARING PLANS,
KM Insinooritoimisto oy Kauppamieher, Tapiola (Finland).
A. Jaatinen.
In: The Use of Computer Techniques and Automation for Water Resources Systems, Washington, D.C., April 1974, Vol. II, p 151-154.

Descriptors: *Evaluation, *Planning, *Computers, *Methodology, Decision making, W

esources, Environment, Resources allocation, enefits, Value.
lentifiers: Goals, *TASAM method, *Goal ierarchy.

onsciousness of goals in planning and assessing e value of plans in relation to the realization of a t of goals are becoming the most important ases in the entire planning process. The more mprehensive the planning, the more the quantity d contradiction of the goals set for the results of e planning increase. Presented is TASAM, a mputer method which helps decision makers hieve goal-setting and evaluation of plans by eans of a simple and systematic process. As oblems become more complex, it enables the ndling of goals in different mutual logic relation-ips. The method makes possible the evaluation matters that cannot be assessed in terms of oney or other measuring units. In addition, the provability information derived from TASAM ables the allocation of the resources available in e best way possible. (See also W76-12535) (Bell-rnell)
76-12559

IE APPLICATION OF MATHEMATICAL ODELS AND OPTIMIZATION TECHNIQUES PLANNING WATER SUPPLY AND WASTE ATER DISPOSAL SYSTEMS,
chigan Univ., Ann Arbor. Dept. of Environ-ntal and Industrial Health.
A. Deininger.
The Use of Computer Techniques and Auto-tion for Water Resources Systems, Washing-, D.C., April 1974, Vol. II, p 154-157. 1 ref.

scriptors: *Water supply development, *Waste ter disposal, *Planning, *Optimization, Mathe-tical models, Decision maing, *Water ources, Water quality, River basins, Water ality control, *Environmental control, Systems alysis.
ntifiers: *Developing countries, Health im-vement.

e World Health Organization believes firmly t mathematical models and optimization hniques play an important role in solving the blems of environmental control for the im-vement of the health of the population, particu-y in developing countries. Considered herein is use of these methods by planners and en-eers as tools providing increased capabilities of erating information that can be used in the ision-making process. Discussed also are water ply models and waste water disposal models. IO is actively using these techniques in many jects to varying degrees; they have become im-tant aids for modern environmental health en-eers and planners. (See also W76-12535) (Bell-nell)
5-12560

OF INVESTMENT MODELS AND CHOICE ALTERNATIVE DECISIONS FOR THE OP-IUM DISTRIBUTION OF WATER OURCES AT THE STAGE OF PLANNING MEANS OF COMPUTERS,
soyuznyi Nauchno-Issledovatelskii Institut otekhniki i Melioratsii, Moscow (USSR).
. Papisov, Oziransky, A. V. Abramova, and . Rappoport.
The Use of Computer Techniques and Auto-on for Water Resources Systems, Washing-D.C., April 1974, Vol. II, p 157-162. append.

criptors: *Water distribution(Applied), *Water urces, *Long-term planning, *Economics, imization, Alternative planning, Computers, stment, Decision making, River basins, Water ly, Simulation analysis, Mathematical els, Equations, Systems analysis.
tifiers: *USSR, Cost minimization, Multi-nt analysis.

The optimum distribution of water resources of a country by areas and branches of the national economy is the necessary condition for their rational use, expecially in the territorial redistribution of river flow. In the USSR, different variants of using water resources are assessed from the viewpoint of investments for the creating of national economy complexes. Hence models for optimizing water distribution are investment-type models. Financial expenditures include annual operation expenses and depreciation. Choice of the optimum variant of the distribution of water resources is made by the minimum of the 'discounted' expenditure. This report deals with a model for optimizing the use of interbasinflow transfer by the branches of the national economy and areas on the stage of designing and long-term planning. For problem solution, a model of inter-area, inter-branch and intra-brach optimization has been elaborated, simulating an upper level of the development of the economy. The model consists of hierarchically subordinated blocks describing a complex economic system. (See also W76-12535) (Bell-Cornell)
W76-12561

ELABORATION AND USE OF A MATHEMATICAL MODEL TO FORECAST IN QUANTITY AND QUALITY, THE WATER DEMANDS OF VARIOUS SECTORS OF INDUSTRY,
Societe du Canal de Provence et d'Amenagement de la Region Provencale Le Tholonet, Aix-en-Provence (France).
For primary bibliographic entry see Field 6D.
W76-12562

OPTIMAL DEVELOPMENT PROGRAMME FOR REGIONAL WATER SUPPLY SYSTEMS,
National Water Authority, Budapest (Hungary).
I. Orloci.
In: The Use of Computer Techniques and Automation for Water Resources Systems, Washington, D.C., April 1974, Vol. II, p 166-169.

Descriptors: *Water supply development, *Regional development, *Economics, *Optimization, *Mathematical models, Water demand, Systems analysis.
Identifiers: *Hungary, Cost minimization.

This article considers an economic optimization model which has been applied in preparing a water supply development program in an important industrial region of Hungary. The model is associated with economic measures which are realized in the increase of the capacity of waterworks. The criterion for optimal operation is the sum of damages due to unsatisfied demands resulting from the expensiveness of measures and the limited funds of investment. The model is divided into three main parts: (1) the background of operation, comprising the natural-social processes; (2) the siting model, involving the building-block system construction of potential engineering solutions; and (3) the scheduling of investments. In the course of mechanical computations, the optimal parameters of the water supply system corresponding to average evolution have been determined on the basis of about 500 criteria from around 800 decision alternatives. (See also W76-12535) (Bell-Cornell)
W76-12563

SIMPLIFIED DECISION MODEL FOR NATIONAL WATER SUPPLY DEVELOPMENT,
National Water Authority, Budapest (Hungary).
J. Csuka.
The Use of Computer Techniques and Automation for Water Resources Systems, Washington, D.C., April 1974, Vol. II, p 169-174. 1 fig, 8 equ.

Descriptors: *Water supply development, *Water management(Applied), *Decision making, *Long-term planning, *Regional analysis, *Linear programming, Optimization, Equations, Waste water(Pollution), Water quality, Stochastic processes, Projects, Systems analysis.
Identifiers: *Hungary, Developing countries.

In the evolution of water management, the complete, comprehensive control of runoff, as well as the utilization of water resources to the maximum possible engineering and economic benefits at the simultaneous observation of the highly complex interrelations between regional, sectorial, social and economic interests, emerge as problems of growing significance. The main problems of decision making to meet these demands and a scheme of the system of mathematical models corresponding is given. The decision is directed at the determination of the combination of water management hydro-technical projects satisfying optimally various interests, with due consideration to economic, natural legal, political and social interrelations and allowance for the laws of physics, as well as for other effects anticipated in other domains of life and the natural environment. A long-range planning model for water supply has been evolved in Hungary. The model is a linear, deterministic programming model which functions dynamically by the determination and defined interrelations of its variables. (See also W76-12535) (Bell-Cornell)
W76-12564

COMPUTER APPLICATION IN PROCESSING TECHNICAL AND ECONOMIC DATA FOR OPTIMIZING COMPLEX WATER RESOURCES SYSTEMS,
Belorussian Central Research Inst. for Water resources, Minsk.
A. N. Kolobaev, and A. V. Skatchek.
In: The Use of Computer Techniques and Automation for Water Resources Systems, Washington, D.C. April 1974, Vol. II, p 175-177.

Descriptors: *Water resources development, Computers, *Economics, *Optimization, *Data processing, Data transmission, Data collections, *Computer programs, Comprehensive planning, Systems analysis.
Identifiers: USSR.

The large-scale development of water resources systems imposes more stringent requirements for water object design, construction, and operation. One of these is to make technical and economic provisions for water projects. Great progress has recently been made in the USSR in developing optimization methods for water resources systems, but a lack of needed statistical, project, and economic planning information impedes the introduction of advanced mathematical-economical models and hampers efficient management. The introduction of a system for data collection, transmission, processing and analysis, the development of methods for water resources optimization, and the large-scale application of automatic devices and instruments facilitate transition to automatic optimized water resources management systems. Listed herein are the optimization tasks, the basic information needed to solve operating conditions optimization tasks, and the technical and economic data required for systems optimization. The use of computers to facilitate the comprehensive, complex information gathering, storage and retrieval is discussed. (See also W76-12535) (Bell-Cornell)
W76-12565

CONSTRUCTION AND UTILIZATION OF COMPLEX MATHEMATICAL MODELS IN THE PLANNING OF THE OPTIMAL DEVELOPMENT OF LARGE HYDROGRAPHIC SYSTEMS AND RIVER BASINS,
Ecole Nationle Superieure des Mines de Paris, Fontainebleau(France). Center for Geological Information.
For primary bibliographic entry see Field 4A.
W76-12566

THE RECREATIONAL USE OF WATER AS PART OF THE INTEGRATED PLANNING OF LARGE WATER SYSTEMS,
National Water Board of Finland, Helsinki. Office for Water Pollution and Recreation Use of Waters.
For primary bibliographic entry see Field 6B.
W76-12567

AN APPROACH TO RESEARCH ADMINISTRATION,
Texas Univ. at Austin. Center for Research in Water Resources.
For primary bibliographic entry see Field 6B.
W76-12575

6B. Evaluation Process

THE WINOOSKI WORKSHOPS: AN ASSESSMENT OF SPECIFIED WORKSHOP TECHNIQUES FOR STIMULATING AND IMPROVING PUBLIC INVOLVEMENT IN WATER RESOURCES,
Vermont Univ., Burlington. Water Resources Research Center.
A. S. Wilm, and K. L. Thomas.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 545, $5.00 in paper copy, $3.00 in microfiche. Completion Report, (1975). 90 p, 4 fig, 9 tab, 56 ref. OWRT A-020-Vt(1). 14-31-0001-5046.

Descriptors: Communication, River basins, Water resources, *Social participation, *Vermont, Water quality, Planning, Social aspects, *Attitudes.
Identifiers: *Public participation, *Winooski River Basin(Vt).

Public participation is a dynamic communication process within a social system, a source of information and support for social and economic goals. Current interest in citizen participation is sparked by changes in social values and more specifically by a change in the public's perception of government responsibility. Vermont is drawing up its River Basin Water Quality plans for the major rivers of the State. Agencies have called for citizen input. This provided an opportunity to test a commonly used workshop technique for involving citizens against a second format which involved a more social-psychological orientation and small group problem-solving techniques. The purpose of this project was to test the hypothesis that differences in environmental settings reflect, and are reflected in citizen motivation levels to become involved in water resource decision-making. Two distinctly different types of meetings were held in the Winooski River Basin. A secondary focus was an analysis of citizen motivations to become involved as reflected in questionnaire responses and attendance rates. Participants for this study were found by use of a variation of the technique developed to identify 'community influentials'. Differences found, due to the environmental settings, reflect research findings observed in more 'controlled' experimentation.
W76-12151

ALLOWANCE FOR THE STOCHASTIC CHARACTER OF HYDROLOGICAL DATA IN WATER PROJECT DECISIONS,
National Water Authority, Budapest (Hungary). Engineering Secretariat.
For primary bibliographic entry see Field 7A.
W76-12439

ECONOMIC UNCERTAINTIES IN WATER RESOURCES PROJECT DESIGN,
Eotovs Lorand Univ., Budapest(Hungary).
For primary bibliographic entry see Field 6A.
W76-12514

A DYNAMIC REGIONAL MODEL FOR EVALUATING RESOURCE DEVELOPMENT PROGRAMS,
Manitoba Univ., Winnipeg. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 4A.
W76-12520

A STUDY OF RESEARCH AND DEVELOPMENT IN ENVIRONMENTAL ENGINEERING USING SYSTEM APPROACH,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
M. Thompson.
Research Report, RR-74-13, International Institute for Applied Systems Analysis, Laxenburg, Austria, August 1974. 54 p, 3 fig.

Descriptors: *Research and development, *Environmental engineering, *Systems analysis, *Social aspects, Mathematical models, Management, Water quality, Air pollution, Effects, Economics, Political aspects, Standards, Monitoring, Disasters.
Identifiers: Information flow network, Incentives, International level.

Established is a systems conception for problems of the environment which will serve as foundation for eleven recommendations upon the ways in which research and development efforts in this area may beneficially be redirected. Scientific and managemental approaches to the environment have become fettered by a narrowness of perspective that has limited their potential contributions. Viewpoints adopted in directing and performing research activities should be broadened (1) in geographical extent, (2) in conceptual reach, (3) to embrace more environmental systems, (4) to consider natural systems explicitly, (5) to account for the interconnections of the environment with other social systems, and (6) to heed the social system through which the environment is maintained. Presented are three models of the encompassing social system as it affects the environment. The models feature: a micro-economic view of the firms and households which may despoil the environment; the basic political mechanisms through which environmental wrongs can be set right; and the network of information flows necessary to manage the environment. These systems are examined to identify their weaknesses and discover points of leverage where improvements may be effected. Special attention is devoted to: the distributional equity of proposed policies; the possibilities for direct management of environmental systems; the need for preparation in advance of environmental disasters, the establishment of standards, and environmental monitoring. Finally, the study identifies environmental responsibilities at the international level which crucially require fulfillment. (Bell-Cornell)
W76-12533

EVALUATING TISZA RIVER BASIN DEVELOPMENT PLANS USING MULTIATTRIBUTE UTILITY THEORY,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
For primary bibliographic entry see Field 4A.
W76-12534

THE USE OF COMPUTER TECHNIQUES AND AUTOMATION FOR WATER RESOURCES SYSTEMS.
Economic Commission for Europe (UN), New York. Committee on Water Problems, Economic and Social Council.
For primary bibliographic entry see Field 6A.
W76-12535

PRESENT SITUATION AND TRENDS IN THE APPLICATION OF ADVANCED METHODS AND TECHNIQUES FOR WATER RESOURCES MANAGEMENT.
Economic Commission for Europe (UN), New York.
For primary bibliographic entry see Field 7C.
W76-12536

OPTIONS OF DEVELOPMENT AND INTEGRATED MANAGEMENT OF WATER RESOURCES,
Ecole Nationale Superieure des Mines de Paris, Fontaine-bleau (France). Center for Geological Information.
Y. Emsellem.
In: The Use of Computer Techniques and Automation for Water Resources Systems, Washington, D.C. 1974, Volume II, p 11-15.

Descriptors: *Water resources development, *Management, *Planning, *Methodology, *Cost benefit analysis, Optimum development plan, Hydraulic systems, Economics, Mathematical models, Environment, Comprehensive planning, Water pollution control.
Identifiers: *France, Multiple objectives.

Planning for the management and use of water resources depends first on the political aims of development and secondly on the consequences induced by the application of these programs. The characteristic of these two types of variables is to imply essentially an important part of nonnumerical values. More precisely, the classical cost benefit analysis only takes into account the market values. However, for progress, a larger methodology, taking into consideration the nonmerical character of the out-of-market variables the environment is needed and has been developed. In order to develop concrete procedures, a group of nine inter-disciplinary teams is experimenting on the 115.000 sq. km basin of the Agence Financiere 'Adour-Garonne' in France. The general attempt is to build as large as possible, using the best available tools, and to study the different aspects related with complex problems, such as the variations of certain parameters with policy. Since programming helps to clarify and optimize the objective function and big computers may handle large systems efficiently, the natural method is to try and represent the problems by a model which can be programmed. (See also W76-12535) (Bell-Cornell)
W76-12538

SURFACE WATER AND GROUND WATER INTERACTION PHENOMENA IN PLANNING MODELS,
Geological Survey, Washington, D. C.
For primary bibliographic entry see Field 4B.
W76-12553

USE OF INVESTMENT MODELS FOR THE LONG-TERM PLANNING OF A WATER RESOURCE SYSTEM FOR ENGLAND AND WALES,
Water Resources Board, Reading (England).
For primary bibliographic entry see Field 6A.
W76-12557

USE OF OPTIMIZATION MODELS IN WATER RESOURCES ALLOCATION AND CHOICE OF INVESTMENTS BY MEANS OF COMPUTERS,
Research and Design Inst. for Water Resources Engineering, Bucharest (Rumania). Water Economy Section.
For primary bibliographic entry see Field 6A.
W76-12558

TASAM, A METHOD FOR SETTING GOALS, EVALUATING AND COMPARING PLANS,
KM Insinooritoimisto oy Kauppamiehet, Tapiola (Finland).
For primary bibliographic entry see Field 6A.

UNIV. OF ILL. URBANA-CHAMPAIGN

W76-12559

USE OF INVESTMENT MODELS AND CHOICE OF ALTERNATIVE DECISIONS FOR THE OPTIMUM DISTRIBUTION OF WATER RESOURCES AT THE STAGE OF PLANNING BY MEANS OF COMPUTERS,
Vsesoyuznyi Nauchno-Issledovatelskii Institut Gidrotekhniki i Melioratsii, Moscow (USSR).
For primary bibliographic entry see Field 6A.
W76-12561

IMPLIFIED DECISION MODEL FOR NATIONAL WATER SUPPLY DEVELOPMENT,
National Water Authority, Budapest (Hungary).
For primary bibliographic entry see Field 6A.
W76-12564

OMPUTER APPLICATION IN PROCESSING ECHNICAL AND ECONOMIC DATA FOR OPIMIZING COMPLEX WATER RESOURCES YSTEMS,
elorussian Central Research Inst. for Water sources, Minsk.
or primary bibliographic entry see Field 6A.
76-12565

HE RECREATIONAL USE OF WATER AS ART OF THE INTEGRATED PLANNING OF ARGE WATER SYSTEMS,
ational Water Board of Finland, Helsinki. Office r Water Pollution and Recreation Use of Waters.
. Sarkka.
: The Use of Computer Techniques and Autoation for Water Resources Systems, Washingn, D.C., April 1974, Vol II, p 180-186.

escriptors: *Recreation, *Water utilization, lanning, *Water resources, *Lake shores, Comters, Estimating, Boats, Environment, Beaches, rimming, Water pollution, Mathematical odels, Methodology, Systems analysis, Regional alysis.
ntifiers: *Finland, Regional planning.

ce the 1950s, the recreational use of water has veloped to such a high extent in Finland that it w plays a very central role in all forms of renal planning. This article considers mathemati- models for various types of data processing l outlines some examples of applications of nning techniques for recreational uses of waterrses. Considered are: estimation of volume of t traffic; classification of lake shores from the wpoint of recreational use; classification of es and their shores with a view to recreational and environmental protection in regional nning; estimation of beaches' suitability for mming on the basis of factors that influence appropriateness; and a study of recreational s of watercourses in the Lohja District. (See W76-12535) (Bell-Cornell)
6-12567

APPROACH TO RESEARCH ADMINISTRAN,
as Univ. at Austin. Center for Research in er Resources.
mmerman.
pletion Report, December 1975. 49 p, 31 ref. RT X-146 (4270)(1).

criptors: *Research and Development, *Water urces development, *Resources development, mprehensive planning, Evaluation, Energy get, Water demand, Water requirements, er management, Water supply, Analytical niques, *Research priorities, *Great Plains, gy.
tifiers: Research implementation, Problem ification research, Innovation research, sibility reserach, Consequences rch(Northern Great Plains), Research adtration.

A procedure is described for analyzing research problem areas, identifying possible courses of research, selecting alternative courses, comparatively evaluating such courses and implementing research activities. Types of research that are needed in the course of problem solving are problem identification research, innovation research, feasibility research and consequences research. This general approach to research administration is partially illustrated in relation to the problem of increasing water supplies for energy production in the northern Great Plains region.
W76-12575

BENEFIT COST ANALYSIS--A NECESSARY PART OF ENVIRONMENTAL DECISIONING,
Minnesota Univ., Duluth. Dept. of Economics.
For primary bibliographic entry see Field 6G.
W76-12576

NORTHEASTERN UNITED STATES WATER SUPPLY STUDY, INTERIM REPORT, CRITICAL CHOICES FOR CRITICAL YEARS.
Army Engineer Div. North Atlantic, New York.
For primary bibliographic entry see Field 6D.
W76-12584

OUTDOOR RECREATION PLANNING AND RESEARCH IN THE U.S.A.,
National Foundation for Scientific Research (NFWO), Ghent (Belgium).
E. Van de Walle.
Research report, No. 2, November, 1975. 49 p.

Descriptors: *Planning, *Recreation, *Recreation facilities, *National recreation areas, Parks, Bureau of Outdoor Recreation(BOR), Government, Texas, Washington DC, Michigan, Wisconsin, Colorado, Wyoming, Utah, California.
Identifiers: Outdoor recreation, *Outdoor recreation research, Statewide Comprehensive Outdoor Recreation Plan(SCORP), Nationwide Outdoor Recreation Plan.

Information is presented on the organization of outdoor recreation research in the United States, listing of recreation specialists contacted, comments concerning important U.S. research reports and books on the subject, and a portion of the results obtained in the study. The study includes sections on Texas, Washington, D.C., Michigan, Wisconsin, Colorado, Wyoming, Utah and California. Various public agencies, Federal and State, are discussed in some detail. Concluding remarks indicate that public involvement in providing recreation opportunity at all levels is an essential element. Three federal departments have major research responsibilities: (1) the Department of the Interior, where the Bureau of Outdoor Recreation concentrates on nationwide planning with statewide outdoor recreation coordinated through regional offices. Research is conducted by universities or independent institutions under BOR sponsorship; (2) The Department of Agriculture where research is conducted by regional Forest Range and Experiment Stations and Agricultural Experiment Stations; (3) The Corps of Engineers which has an active research program related to future reservoir planning. Almost all research programs at the state level are related to the Statewide Comprehensive Outdoor Recreation Plan (SCORP). A multiple regression analysis is used to determine the influence of socio-economic factors and independent variables upon participation rates. It is thought that Western European countries can benefit from studying the way recreation planning is done in the U.S., though the vastness of the land obviously gives recreation in the U.S. some unique characteristics. (Smith - North Carolina)
W76-12585

MANAGEMENT OF WATER RESOURCES UNDER DIFFERENT SOCIO-ECONOMIC CONDITIONS,
Arizona Univ., Tucson.
S. M. H. Bokhari.
Available from University Microfilms, Inc., Ann Arbor, Mich. 48106. Order No. 76-11, 320. Ph.D. Thesis, 1975, 306 p.

Descriptors: *Water management(Applied), *Planning, *Social aspects, *Regional economics, *Regional development, Regional analysis, United States, Asia.
Identifiers: *Pakistan, Welton-Mohawk Irrigation District.

Major lags still exist between the developed and developing countries with respect to water management, and theory and practices diverge even in the developed countries. The Wellton-Mohawk Irrigation District in the United States and the Salinity Control and Reclamation Project Number One in Pakistan are compared as examples of water management under different sociological conditions. Multi-disciplinary teams of professionals from developing countries should be trained to make planning and management more effective. Implementation capabilities in developing countries should be improved, so that projects can be completed more rapidly. Adequate financial allocation is required during implementation and operation. The latest rain harvesting and runoff agricultural techniques should be introduced in dry farming area in Pakistan's upland plateau. Tubewells will make the system more flexible and save funds for important complementary programs. There should be more emphasis on planning, operations, and evaluation of public investments concerned with water. (Snyder-FIRL)
W76-12626

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

ENERGY COSTS OF WASTEWATER REUSE,
Arizona Univ., Tucson. Economic and Business Research.
For primary bibliographic entry see Field 5D.
W76-12215

ECONOMIC COSTS OF CONTROLLING WATER QUALITY THROUGH MANAGEMENT OF IRRIGATION RETURN FLOWS,
Washington State Univ., Pullman. Coll. of Agriculture.
For primary bibliographic entry see Field 5G.
W76-12218

DISPOSAL ALTERNATIVES FOR INTERMITTENT SAND FILTER SCRAPINGS UTILIZATION AND SAND RECOVERY,
Utah Center for Water Resources Research, Logan.
For primary bibliographic entry see Field 5D.
W76-12219

COST OF WATER POLLUTION CONTROL IN THE CARPET INDUSTRY,
Exxon Research and Engineering Co., Florham Park, N.J. Water Pollution Control Section.
For primary bibliographic entry see Field 5G.
W76-12422

COST FUNCTIONS FOR WASTEWATER CONVEYANCE SYSTEMS,
Louvain Univ. (Belgium). Groupe de Travail en Economie de l'Environnement.
For primary bibliographic entry see Field 5D.
W76-12513

AVERAGE RISE OF EPA PLANT, SEWER INDEXES SLOWS.
For primary bibliographic entry see Field 5D.
W76-12598

SEWAGE PLANT UPGRADES EFFLUENT.
For primary bibliographic entry see Field 5D.
W76-12613

6D. Water Demand

PRELIMINARY ANALYSIS OF GEOHYDROLOGIC DATA FROM TEST WELLS DRILLED NEAR CHALK POINT, PRINCE GEORGES COUNTY, MARYLAND,
Geological Survey, Parkville, Md.
For primary bibliographic entry see Field 4B.
W76-12289

IMPACT OF HURRICANE TIDAL SURGES ON SUBSEQUENT LAND USE CHANGES AND WATER RESOURCES REALLOCATION,
University of Southern Mississippi, Hattiesburg. Dept. of Geography and Area Development.
For primary bibliographic entry see Field 4A.
W76-12461

ELABORATION AND USE OF A MATHEMATICAL MODEL TO FORECAST IN QUANTITY AND QUALITY, THE WATER DEMANDS OF VARIOUS SECTORS OF INDUSTRY,
Societe du Canal de Provence et d'Amenagement de la Region Provencale Le Tholonet, Aix-en-Provence (France).
C. Bareau.
In: The Use of Computer Techniques and Automation for Water Resources Systems, Washington, D.C., April 1974, Vol. II, p 163-165. 1 tab.

Descriptors: *Water supply, *Forecasting, *Industrial water, *Water quality, Water demand, Industries, Planning, Hydraulics, Methodology, Management.
Identifiers: *Southwestern France.

In hydraulics development schemes, supply and demand are expressed by the same physical quantity. From such data, planning bodies try to optimize water supply management to meet various potential uses. Today, this methodology is no longer satisfactory; the supply concept itself must be re-defined. Water management patterns must account for each and every parameter of quality. Presented is a method for forecasting industrial water supply. To each area of use, the pattern connects a five-dimensional request vector, determined from an inquiry made in southwestern France. Five ranges of water use for manufacturers have been examined: (1) waters used for conveyance; (2) cooling waters; (3) heating waters; (4) manufacture waters; and (5) sanitary and home waters. Results show that factories having identical products manufactured require very different unitary water quantity vectors. The results are aggregated for the whole industrial areas of the investigated zone, including the five uses mentioned and seven activity areas corresponding to an industrial amalgamation used in the national statistics. (See also W76-12535) (Bell-Cornell)
W76-12562

NORTHEASTERN UNITED STATES WATER SUPPLY STUDY, INTERIM REPORT, CRITICAL CHOICES FOR CRITICAL YEARS.
Army Engineer Div. North Atlantic, New York.
November 1975. 89 p, 16 fig, 7 tab, 97 ref.

Descriptors: *Water supply, *Water demand, *Water shortage, *Water resources development, Population, *New York, *Massachusetts, *Rhode Island, *Water management, Water quality, Water reuse, Water yield improvement, Droughts, Planning, *District of Columbia.
Identifiers: *Washington Metropolitan Area, *New York Metropolitan Area, *Eastern Massachusetts-Rhode Island Metropolitan Area.

Critical problems of developing water supply sources to meet growing demand are foreseen in the next 20 to 25 years for 3 metropolitan areas, Washington, New York and Eastern Massachusetts-Rhode Island. Major alternatives for water supply, along with advantages and disadvantages, are examined so that responsible government decisions can be made. Population projections were used to year 2020 to predict water demand. Possible supply alternatives were identified for each area to determine critical needs. By 2020 population of 80 million is predicted for this region which extends from Maine to Virginia. Along with the 3 critical metropolitan areas explored here, 26 other urban areas with potential long range problems have been studied in a separate report. Solutions offered must meet 4 criteria: reliability, flexibility, timeliness, and equity. Underlying premises are: demand will increase with population and economic growth, direct reuse of waste water will not be widely accepted, there will be no changes in ownership of water supplies, droughts will continue to occur, and demand cannot be materially reduced through legislation or changing habits before the 1990s. No major water supply projects have been built in the critical areas since the 1960s yet safe yields in some systems have been repeatedly surpassed. It is noted that considerable increase in price (in multiples of 100%) is needed to affect demand. Sources, projects and illustrative combinations of projects are given for each critical area. Several branches of a decision tree are explored, each considering a different mix of goals such as cost, environmental quality, regional needs, reliability and equity. (Smith-North Carolina)
W76-12584

6E. Water Law and Institutions

GROUNDWATER PROPERTY RIGHTS AND CONTROVERSIES IN MONTANA,
Montana State Univ., Bozeman. Dept. of History, Government and Philosophy.
R. Dunbar.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 516, $5.00 in paper copy, $3.00 in microfiche. Research Report No. 76, Montana University Joint Water Resources Research Center, Bozeman, April 1976, 75 p. OWRT A-059-MONT(1).

Descriptors: Water law, *Groundwater, *Property rights, *Water rights, *History, Prior appropriation, *Montana, Regulation.
Identifiers: *Water law history, *Montana water law.

When Montana was dubbed the Treasure State, few of her citizens were aware of the abundance of groundwater beneath their feet. Nor were they concerned about the property right in it, a right which their lawmakers had borrowed from the more humid states. However, as Montanans began to learn through hydrologic surveys the extent of the resource and to increase its exploitation, some farsighted individuals sought first to conserve it through regulation of the right and then to change the right itself. These efforts provoked controversies. Out of the crucible of these controversies, Montanans forged a new property right and new institutions to protect it. This report is an historical analysis and accounting of these controversies. (Holje-Montana State)
W76-12154

REFORM OF ILLINOIS WATER RESOURCE LAWS WITH PARTICULAR REFERENCE TO THE DRAINAGE CODE AND CLOSELY RELATED LAWS,
Illinois Univ. at Urbana-Champaign. Dept. of Agricultural Economics.
D. L. Uchtmann, and N. G. P. Krausz
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 53[illegible] $5.00 in paper copy, $3.00 in microfiche. Illinois Water Resources Center, Urbana. Research Report No. 114, June 1976. 94 p, append. OWRT A-076-ILL(1). 14-31-0001-6014.

Descriptors: *Water districts, Organization, *Jurisdiction, *Institutions, Government, *Planning, Control, Regulation, Coordination, *Illinois, Water law, Water rights, Legal aspects, *State governments, Drainage districts, Legislation.
Identifiers: *Drainage codes(Law).

Laws affecting Illinois water resources form a highly complex and fragmented water resource system. Many special purpose or general governmental units have varying responsibility in areas of drainage, soil and water conservation, sewage treatment and water quality, water supply and use, flood control, recreation and navigation. This existing structure gives rise to numerous inherent problems. Each state adjoining Illinois has made significant changes in its system for administering and controlling water. In addition, Nebraska, Ohio and Florida have made significant changes in their water systems. The water law programs of these states have been analyzed to determine what procedures and structure might be adopted for Illinois. Regarding drainage laws, in particular, a survey of drainage district attorneys and engineers in Illinois identifies specific areas of dissatisfaction. The surveys also offer suggestions for improvement. Recommendations for reform of Illinois water resource laws include a long term reform of the overall structure. This long term recommendation includes the establishment of a state agency with broad powers in areas of general planning and coordination and the combining of many existing local special purpose districts into multi-purpose local districts. The recommendations also include specific changes to the existing drainage code that can be accomplished independent of the overall restructuring.
W76-12217

PROCEEDINGS OF THE TWENTY-EIGHTH ANNUAL GULF AND CARIBBEAN FISHERIES INSTITUTE.
Miami Univ., Fla.
For primary bibliographic entry see Field 6G.
W76-12226

MULTIPLE-USE CONFLICTS BETWEEN FISHERMEN AND OTHER USERS OF THE OCEAN WITH A CONSIDERATION OF POSSIBLE EXPANDED FEDERAL ROLE,
National Oceanic and Atmospheric Administration, Rockville, Md., Office of Living Resources.
For primary bibliographic entry see Field 6G.
W76-12227

FLOOD-HAZARD EFFECTS ON RESIDENTIAL PROPERTY VALUES,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6G.
W76-12529

WATER QUALITY LAW IN FEDERAL REPUBLIC OF GERMANY,
Bonn Univ. (West Germany). Inst. fuer das Recht der Wasserwirtschft.
For primary bibliographic entry see Field 5G.
W76-12531

A LEGAL-HISTORICAL ANALYSIS OF NAVIGATION USER CHARGES,
Department of Environment, Ottawa (Ontario).
P. M. Ashton, C. Cooper-Ruska, and L. A. Shabman.

ournal of the Water Resources Planning and Management Division, Proceedings of the Amer-can Society of Civil Engineers, Vol. 102, No. WR1, p 89-100, April 1976. 32 ref.

Descriptors: *Water resources, *Navigation, conomics, History, Legislation, Water policy, Water law, Political aspects, Investment, Efficien-es, *Canada.
Identifiers: *Waterways(Transportation), Navigation user charges.

oll-free use of the nation's inland waterway ansportation network is shown to be a political nd economic anachronism. The historical evelopment of this free-use policy is traced from e early days of promotion of regional economic evelopment under the legal sanctions of the com-erce Clause of the Constitution and the orthwest Ordinance. In an age of scarce funds r public works, the toll-free waterway program ems to be an outstanding candidate for applica-n of the 'beneficiaries pay' principle. Equity nsiderations, promotion of efficiency between nsport modes, and public investment efficiency nsiderations suggest that a revision might be al in theory but would likely face substantial litical opposition in practice. (Bell-Corneli)
76-12532

E 'POLPOLE' MODEL: AN ATTEMPT TO ALYSE THE WATER SYSTEM IN THE NANCIAL AGENCY OF A FRENCH RIVER SIN,
ancial Agency of the Basin 'Seine-Normandie', is (France).
r primary bibliographic entry see Field 4A.
6-12556

E OF INVESTMENT MODELS FOR THE NG-TERM PLANNING OF A WATER SOURCE SYSTEM FOR ENGLAND AND LES,
ter Resources Board, Reading (England).
primary bibliographic entry see Field 6A.
6-12557

METHODOLOGY TO MEASURE THE PER-RMANCE OF THE EPA REGIONAL EIS VIEW PROCESS,
onne National Lab., Ill. Energy and Environ-tal Studies Div.
primary bibliographic entry see Field 6G.
-12583

TDOOR RECREATION PLANNING AND EARCH IN THE U.S.A.,
onal Foundation for Scientific Research WO), Ghent (Belgium).
primary bibliographic entry see Field 6B.
-12585

Nonstructural Alternatives

OD DAMAGE REDUCTION POTENTIAL RIVER FORECAST SERVICES IN THE NECTICUT RIVER BASIN,
onal Weather Service, Silver Spring, Md. Of-f Hydrology.
rimary bibliographic entry see Field 4A.
12186

OD HAZARD ANALYSES FOR LOWER SH CREEK (INCLUDING SELECTED UTARIES), BANNOCK COUNTY, IDAHO.
Conservation Service, Boise, Idaho.
rimary bibliographic entry see Field 4A.
12580

CLARKS CREEK FLOOD PLAIN STUDY, CATAWBA COUNTY, NORTH CAROLINA.
Soil Conservation Service, Raleigh, N. C.
For primary bibliographic entry see Field 4A.
W76-12582

FLOOD HAZARD ANALYSES REPORT: EAST BRANCH NIMISHILLEN CREEK, STARK COUNTY, OHIO.
Soil Conservation Service, Columbus, Ohio.
For primary bibliographic entry see Field 4A.
W76-12586

FLOOD HAZARD INFORMATION: BACKLICK CREEK, VIOLET TOWNSHIP, FAIRFIELD COUNTY, OHIO.
Army Engineer District, Huntington, W. Va.
For primary bibliographic entry see Field 4A.
W76-12592

FLOOD PLAIN INFORMATION: FRESH-WATER CREEK, HUMBOLDT COUNTY, CALIFORNIA.
Army Engineer District, San Francisco, Calif.
For primary bibliographic entry see Field 4A.
W76-12593

FLOOD PLAIN INFORMATION: YELLOW RIVER, PART III, METROPOLITAN ATLANTA, GEORGIA.
Army Engineer District, Savannah, Ga.
For primary bibliographic entry see Field 4A.
W76-12595

6G. Ecologic Impact Of Water Development

COASTAL ENGINEERING CONFERENCE. FOURTEENTH. PROCEEDINGS. COPENHAGEN, DENMARK, JUNE 24-28, 1974.
American Society of Civil Engineers, New York.
For primary bibliographic entry see Field 5G.
W76-12221

ENVIRONMENTAL ANALYSIS FOR BAHAMAS SUPERTANKER PORT,
Erindale College (Ontario).
For primary bibliographic entry see Field 5G.
W76-12222

ENVIRONMENTAL PROBLEMS ASSOCIATED WITH A PIPELINE LANDFALL IN COASTAL DUNES AT CRUDEN BAY, ABERDEENSHIRE, SCOTLAND,
Aberdeen Univ. (Scotland).
For primary bibliographic entry see Field 5G.
W76-12223

OCEAN 72, IEEE INTERNATIONAL CONFERENCE ON ENGINEERING IN THE OCEAN.
Institute of Electrical and Electronics Engineers, Inc., New York.
For primary bibliographic entry see Field 5G.
W76-12224

ENVIRONMENTAL CONSIDERATIONS OF OFFSHORE GENERATING STATIONS,
Public Service Electric and Gas Co., Newark, N.J.
For primary bibliographic entry see Field 5G.
W76-12225

PROCEEDINGS OF THE TWENTY-EIGHTH ANNUAL GULF AND CARIBBEAN FISHERIES INSTITUTE.
Miami Univ., Fla.
Gulf and Caribbean Fisheries Institute Proceedings of the Twenty-Eighth Annual held in Bal Harbour, Florida, October, 1975, Published in May 1976. 113 p. J. B. Higman, (ed).

Descriptors: *Continental Shelf, *Environmental effects, Resources development, Water resources, *Fisheries, Biology, Conferences, Biota, Gulf of Mexico.
Identifiers: *Outer Continental Shelf, New York Bight, Caribbean Sea.

A collection of 18 papers constitute the proceedings of the Twenty-Eighth Annual Gulf and Caribbean Fisheries Institute held October 1975 at Bal Harbour, Florida, under the sponsorship of the University of Miami and NOAA Sea Grant Program. Separate sessions were devoted to the subjects: Fisheries jurisdiction, Fisheries biology, and the Continental Shelf. A Fisheries workshop was included. (See W76-12227 thru W76-12229) (Sinha - OEIS)
W76-12226

MULTIPLE-USE CONFLICTS BETWEEN FISHERMEN AND OTHER USERS OF THE OCEAN WITH A CONSIDERATION OF A POSSIBLE EXPANDED FEDERAL ROLE,
National Oceanic and Atmospheric Administration, Rockville, Md., Office of Living Resources.
R. F. Smith.
In: Gulf and Caribbean Fisheries Institute, Proceedings, Twenty-Eight Annual held in Bal Harbour, Florida, October 1975, May 1976. p. 27-34.

Descriptors: *Continental Shelf, *Resources development, *Environmental effects, *Fisheries, *Recreation demand, *Commercial fishing, *Governmental interrelation, Coasts, Planning, Multiple purpose.
Identifiers: *Outer Continental Shelf.

This paper considers the various types of multiple-use conflicts faced by commercial fishermen, and reviews the role of the Federal Government in helping fishermen and workers in other industries to make a living on the same ocean at the same time. The physical, economic, and social aspects of ocean development that may affect the abilty of fishermen to function effectively under mounting multiple-use conflicts are discussed. These problems are not new; but they are no longer localized to a few fishing ports or on isolated fishing grounds. Instead, they occur coast-wide--indeed, worldwide. They are becoming far more complex and have potential impacts upon many more fishermen. The conflicts occur because of competition for ocean space and port facilities, competition for labor and service, and pressures upon the fishermen to change his life style. Such competition and pressures may cause injury, endanger lives, damage vessels and gear, create costly delays, or force a fisherman against his will into other occupations or social patterns. In summary, we are moving into an era of dramatically increasing activity and development throughout most of our continental shelf area. This will have a tremendous impact on the economy and social patterns in many of the nation's coastal communities, and the ultimate effects are difficult to predict. The fact is that there are no major technical problems impeding ocean development that are beyond the capacity of science and engineering to solve. The real problem is in the resolution of social economic, and other multiple-use conflicts. (See also W76-12226) (Sinha-OEIS)
W76-12227

IDENTIFICATION AND MAPPING OF FISHING BANKS ON THE OUTER CONTINENTAL SHELF OF THE GULF OF MEXICO,
Bureau of Land Management, New Orleans, La.
D. Elvers, and J. B. Johnston.
In: Gulf and Caribbean Fisheries Institute, Proceedings, Twenty-Eighth Annual held in Bal Harbour, Florida, October 1975, May 1976. p 35-48, 7 fig, 2 tab, 22 ref.

Descriptors: *Continental Shelf, *Gulf of Mexico, *Environmental effects, *Resources development, Water resources, *Leases, Fish, Management, Mapping, Drilling.
Identifiers: *Outer Continental Shelf, Fishing banks, Fishing grounds, Environmental impact.

The Bureau of Land Management (BLM) began leasing in Gulf federal waters for oil, gas, and sulfur in 1954. Between 1954 and 1971, 23 lease sales were held with the value of the prospects the principal factor guiding the sales. In 1971, formal environmental impact statement preparation began and by 1973 concern for fishing banks, shrimping area, shipwrecks, and coral reefs brought about special stipulations in the Florida Middle Ground, Stetson Bank, East and West Flower Garden banks, and 18 Fathom Lump. Fishing grounds related to bathymetric and geologic features for the Gulf of Mexico can be accurately mapped with modern navigation, side scan sonar, and narrow beam soundings. BLM hopes to add additional details to fishing grounds by use of BLM, NOS, and industry data taken in the course of special studies for impact statements, baseline investigations, archaeologic, and geologic hazard surveys for the Gulf of Mexico and South Atlantic continental shelf and slope. (See also W76-12226) (Sinha - OEIS)
W76-12228

CONTAMINANT EFFECTS ON BIOTA OF THE NEW YORK BIGHT,
State University of New York at Stony Brook. MESA New York Bight Project
For primary bibliographic entry see Field 5C.
W76-12229

BASIC REMOTE SENSING INVESTIGATIONS FOR BEACH RECONNAISSANCE: AN INTERIM REPORT,
Environmental Research Inst. of Michigan, Ann Arbor.
For primary bibliographic entry see Field 2L.
W76-12375

COMPARISON OF ECOLOGICAL IMPACTS OF POSTULATED OIL SPILLS AT SELECTED ALASKAN LOCATIONS. VOLUME I. INTRODUCTION, SUMMARY, METHODOLOGY, EVALUATION AND APPENDICES,
Mathematical Sciences Northwest, Inc., Bellevue, Wash.
For primary bibliographic entry see Field 5C.
W76-12379

TOXIC EFFECTS OF OIL DISCHARGED FROM SHIPS,
Exxon Research and Engineering Co., Linden, N.J. Government Research Labs.
For primary bibliographic entry see Field 5C.
W76-12380

SAND LEVEL CHANGES ON TORREY PINES BEACH, CALIFORNIA,
Scripps Institution of Oceanography, La Jolla, Calif.
For primary bibliographic entry see Field 2L.
W76-12383

ANALYSIS OF THE ROLE OF THE GULF INTRACOASTAL WATERWAY IN TEXAS,
Texas Engineering Experiment Station, College Station.
For primary bibliographic entry see Field 5G.
W76-12389

ENVIRONMENTAL IMPLICATIONS OF MAINTENANCE AND IMPROVEMENT OF THE GULF INTRACOASTAL WATERWAY IN TEXAS,
Texas A and M Univ., College Station. Coll. of Agriculture.
For primary bibliographic entry see Field 5G.
W76-12390

IMPACT OF A MAINSTREAM IMPOUNDMENT ON THE FISH FAUNA OF BIG WALNUT CREEK A SCIOTO RIVER TRIBUTARY IN CENTRAL OHIO,
Ohio State Univ., Columbus. Dept. of Zoology.
T. M. Cavender, and R. L. Crunkilton.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 844, $7.50 in paper copy, $3.00 in microfiche. Ohio Water Resources Center, Columbus, Project Completion Report No. 449, (1976). 191 p, 9 fig, 24 tab, 27 ref. OWRT A-037-OHIO(1).

Descriptors: *Stream fisheries, Dams, *Fish migration, Aquatic environment, *Reservoir fisheries, *Warm-water fish, Sport fish, Rough fish, Water analysis, Temperature, Dissolved oxygen, Pre-impoundment, Post-impoundment, *Fish behavior, *Ohio, Turbidity, Ecology, *Environmental effects, Correlation analysis, Impoundments, *Fish food organisms.
Identifiers: *Fish species diversity, *Big Walnut Creek(Ohio), Hoover Reservoir(Ohio), Scioto River tributory(Ohio).

The accumulated effects of impoundment on Hoover Reservoir have altered the composition and distribution of fishes in Big Walnut Creek. These changes in part have resulted from inundation of the stream channel, prevention of migration, alteration in water velocity, substrate turbidity, temperature and dissolved oxygen. These alterations either directly or indirectly affect species by changing the stream's ecology. Temperature was reduced significantly in the tailwater area affecting the reproductive biology of as many as 22 species of fish that normally migrate to spawn. Turbidity levels fluctuated widely, but were dampened in the tailwater area due to settling action in the reservoir allowing two species of turbidity-intolerant fish to become established. Dissolved oxygen levels never fell below the recommended level of 5 ppm, but the effects of a reduced oxygen level on food organisms are unknown. Widespread changes in the overall fish fauna of Big Walnut occurred as a result of impoundment. Five separate statistical analyses demonstrated these changes. In addition to commonly used indices, a new technique, correlation analysis, was a useful tool in describing how the associations between fish species in communities are changed by impoundment. It was established that diversity (H) at selected stations above and below Hoover Reservoir on Big Walnut remained unchanged, while significant changes occurred in the qualitative makeup of the fish fauna. This indicates that diversity (H) used in conjunction with descriptive analysis provides an overall description of changes resulting from stream impoundment.
W76-12465

INTERDISCIPLINARY MODELS OF WATER SYSTEMS,
Central and Southern Florida Flood Control District, West Palm Beach.
For primary bibliographic entry see Field 6A.
W76-12516

QUANTITATIVE ASSESSMENT OF ENVIRONMENTAL IMPACT,
Parsons (Ralph M.) Co., Pasadena, Calif. Systems Div.
B. Loran.
Journal of Environmental Systems, Vol 5, No 4, p 247-256, 1975. 2 fig, 8 ref.

Descriptors: *Environment, *Assessment, History, Projects, Algorithms, Waste water treatment, Treatment facilities, Decision making, Wa quality, Construction, Operations, Systems ana sis, Administrative agencies.
Identifiers: *Environmental impact assessme Value ratings.

The history of environmental impact and the c rent requirements, guidelines, and coverage of vironmental impact statements are brie reviewed. A procedure for the assessment of vironmental impact is presented. The individ components of the environment induced b proposed action and of the natural environmen the project area are listed, and each imp generated by their interaction is assigned va ratings. The ratings are assembled in an impact cidence matrix, which is then reordered usin data analysis technique, the bond energy gorithm. The new matrix obtained displays inte lated clusters of high-valued ratings, correspo ing to critical environmental areas. The imp comprising each area are grouped according similarity of action and effect, and their asso tion may suggest environmental alternatives. environmental impact from the construction o additional wastewater treatment plant in a re area is assessed to illustrate the effectiveness the procedure. (Bell-Cornell)
W76-12528

FLOOD-HAZARD EFFECTS ON RESIDENT PROPERTY VALUES,
Virginia Polytechnic Inst. and State U Blacksburg. Dept. of Agricultural Economics.
L. A. Shabman, and D. I. Damianos.
Journal of the Planning and Management Divis Proceedings of the American Society of Civil gineers, Vol 102, No WR1, p 151-162, April, 4 tab, 10 ref.

Descriptors: Water resources, Floods, *F damage, *Hazards, *Flood control, Zo Prices, Land, Equations, Systems anal Regression analysis, Flood plain insurance.
Identifiers: Multiple regression anal Economic analysis, *Flood hazards.

Inasmuch as the potential for flooding can re property values, individuals will be encourag promote government policies that reduce damages of flooding, such as dams or subsi flood insurance. On the other hand, policies limit the use of flood-prone land may reduc value of such land even beyond the reductio to flooding potential. Thus, political choice m biased toward structural or property-enha measures as opposed to measures which re property values, regardless of what the so 'best' set of measures might be. To empirical vestigate the validity of the preceding argum the influence of flood hazard on residential perty values has been estimated, examining case study areas. Use of multiple regression a sis to analyze actual sale prices of land parce indicated that: (1) the existence of flood lowers land value; (2) structural flood-c measures increase land prices; and (3) th fluence of flood-plain zoning cannot be identified. (Bell-Cornell)
W76-12529

BENEFIT COST ANALYSIS--A NECESS PART OF ENVIRONMENTAL DECISIONI
Minnesota Univ., Duluth. Dept. of Economic
J. M. Peterson.
Journal of Environmental Systems, Vol. 5, p 291-297, 1975. 1 fig, 5 ref.

Descriptors: *Environment, *Cost-benefit sis, *Pollution abatement, Water quality, De making, Optimization, Costs, Benefits, Ec Economics, Wastes, Effluents, Rivers, aspects, Systems analysis.
Identifiers: Economic optimum.

CORNELL U. DEPT. OF L. URBANA-CHAMPAIGN

ociety may use cost-benefit analysis to set priori-
es in determining the level of environmental pol-
tion they wish to tolerate. The benefits of pollu-
on are derived from the production and con-
mption of goods and services necessary to life.
he estimated social costs of this productive ac-
vity are the costs necessary to reduce or
iminate the wastes from the effluents discharged
to the environment. Therefore, cost-benefit
alysis is appropriate in environmental decision
aking since its proper use insures that society
n reach the ecological stability level without
olating the economic optimum. However,
ological stability may not always be a rational
oice, particularly when dealing with ecological
b regions rather than the global ecosphere. (Bell-
rnell)
76-12576

EVELOPMENT OF RESIDUALS MANAGE-
ENT STRATEGIES,
diana Univ., Bloomington. School of Public and
vironmental Affairs.
r primary bibliographic entry see Field 5G.
76-12581

METHODOLOGY TO MEASURE THE PER-
RMANCE OF THE EPA REGIONAL EIS
VIEW PROCESS,
gonne National Lab., Ill. Energy and Environ-
ntal Studies Div.
P. Butz, and M. J. Senew.
port No. ANL/ES-41. December 1974. 66 p, 1
, 14 tab, 18 ref, 2 append. IAG-D4-H543.

scriptors: *Methodology, *Evaluation,
nagement, Planning, Environment,
nvironmental effects, *Regional analysis.
ntifiers: *Environmental Impact State-
nt(EIS).

e purpose is to develop a methodology that can
used by the Office of Federal Activities (OFA),
t of the Environmental Protection Agency, to
asure the performance of the regional Environ-
ntal Impact Statement (EIS) review process.
tribution of regional resources for EIS review
ies significantly among regions, and without
lanation. This study evaluates factors that may
te such differentials; develops criteria that
y be used in assessing resources requirements;
develops measures of accomplishment for the
review activity. Five regional offices, the
A staff, the EIS reporting system and available
rature were scrutinized. Each region will sub-
quarterly reports which describe most signifi-
t EISs reviewed, and why these EISs were sig-
cant together with descriptions of preliminary
on with other agencies, staff assistance sup-
d and interaction with other EPA offices. To
luate performance of the review process at the
onal level, guidelines are suggested: each type
IS should meet certain criteria; an OFA team
uld be established to review selected EISs and
rmine performance of the region. To improve
ormance appropriate staff must be available in
r region, EIS review must be thorough and
orm, and seminars related to EIS review
uld be conducted. An example checklist is
n which would be used in EIS review. In an
ndix a staffing algorithm is given which
uld aid in establishing appropriate regional
's. (Smith - North Carolina)
-12583

RESOURCES DATA

Network Design

OWANCE FOR THE STOCHASTIC
RACTER OF HYDROLOGICAL DATA IN
TER PROJECT DECISIONS,
onal Water Authority, Budapest (Hungary).
neering Secretariat.
J. Csuka.
Hydrological Sciences Bulletin, Vol. 21, No. 1, p 61-68, March 1976. 1 fig, 4 ref.

Descriptors: *Stochastic processes, *Hydrologic data, *Water management(Applied), *Risks, Value, *Decision making, Water supply, Water resources, Water, Water demand, Irrigation water, Equations, Water utilization, Model studies.
Identifiers: *Water project decisions, Irrigation water supply, Water supply time series, Annual net benefits, Risk pool.

A method was presented for formulating the operating model of water use that included the uncertainty related to the hydrological factors in water management decisions. The model was used for simulating a long time series for water supply, on the basis of which economic data were generated with the help of specific economic indices. The risk pool was estimated, and in the case of project alternatives, decisions allowing for uncertainty were based on the investment costs including the risk pool. Where the costs of risks associated with the alternative selected could be charged, together with the relevant costs against the user, the problem became one of calculating the water rate including risk. The water rate was the annual cost of operation plus the profit and was obtained as the ratio of the water volume delivered. (Roberts-ISWS)
W76-12439

A HIGH SIERRA PRECIPITATION MEASUREMENT PROGRAM, FINAL REPORT ON THE 1975 SEASON,
Atmospherics Inc., Fresno, Calif.
For primary bibliographic entry see Field 2B.
W76-12446

IMPLEMENTATION OF A LARGE SCALE WATER QUALITY DATA MANAGEMENT SYSTEM,
Carnegie-Mellon Univ., Pittsburgh, Pa.
For primary bibliographic entry see Field 5G.
W76-12521

7B. Data Acquisition

CENTRAL SIERRA PROFILING SNOW GAGE: A GUIDE TO FABRICATION AND OPERATION,
Forest Service (USDA), Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 2C.
W76-12158

DEVELOPMENT OF A RADIOACTIVE ISOTOPE PROFILING SNOW GAGE,
Forest Service (USDA), Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 2C.
W76-12159

SEASONAL SNOW SURFACE ENERGY BALANCE IN A FOREST OPENING,
Forest Service (USDA), Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 2C.
W76-12160

MEASUREMENT OF SNOWPACK WETNESS,
Forest Service (USDA), Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 2C.
W76-12162

SNOW WETNESS MEASUREMENTS FOR MELT FORECASTING,
National Aeronautics and Space Administration, Moffett Field, Calif. Ames Research Center.
For primary bibliographic entry see Field 2C.
W76-12165

REMOTE SENSING OR SNOWPACK DENSITY USING SHORTWAVE RADIATION,
National Environmental Satellite Service, Washington, D.C.
For primary bibliographic entry see Field 2C.
W76-12167

O18/O16 ABUNDANCE VARIATIONS IN SIERRA NEVADA SEASONAL SNOWPACKS AND THEIR USE IN HYDROLOGICAL RESEARCH,
Calgary Univ. (Alberta). Dept. of Physics.
For primary bibliographic entry see Field 2C.
W76-12169

RADAR DERIVED SPATIAL STATISTICS OF SUMMER RAIN - EXPERIMENT DESCRIPTION,
Johns Hopkins Univ., Laurel, Md. Applied Physics Lab.
I. Katz, A. Arnold, J. Goldhirsh, T. G. Konrad, and W. L. Vann.
Contractor Report NASA CR-2592, Vol. I of III, September 1975. 87 p, 21 fig, 8 tab, 56 ref. NASA/DOD S-70248AG.

Descriptors: *Virginia, *Radar, *Rainfall, *Data processing, Analytical techniques, Equipment, Instrumentation, Antennas, Projects, Rain, Precipitation(Atmospheric), Summer, Statistics, Weather, Storms, Attenuation, Communication, Remote sensing, Monitoring, Measurement, Meteorology, Electrical engineering.
Identifiers: *Wallops Island(Va), *Radar-weather, Space communication, Rain cell statistics.

An experiment was performed at Wallops Island, Virginia, to obtain a statistical description of summer rainstorms. Its purpose was to obtain information needed for design of earth and space communications systems in which precipitation in the earth's atmosphere scatters or attenuates the radio signal. Rainstorms were monitored with the high resolution SPANDAR radar and the 3-dimensional structures of the storms were recorded on digital tape. Volume I of this series described the equipment, the experiment and tabulated all data obtained during the experiment. (See also W76-12179 and W76-12180) (Sims - ISWS)
W76-12178

RADAR DERIVED SPATIAL STATISTICS OF SUMMER RAIN - DATA REDUCTION AND ANALYSIS,
Johns Hopkins Univ., Laurel, Md. Applied Physics Lab.
T. G. Konrad, and R. A. Kropfli.
Contractor Report NASA CR-2592, Vol. II of III, September 1975. 171 p, 97 fig, 10 tab, 10 ref. NASA/DOD S-70248AG.

Descriptors: *Radar, *Rainfall, *Virginia, *Data processing, *Analytical techniques, Precipitation(Atmospheric), Rain, Summer, Weather, Mathematical models, Statistical models, Statistics, Communication, Attenuation, Remote sensing, Measurement, Meteorology.
Identifiers: *Radar-weather, *Wallops Island(Va), Space communications, Rain cell statistics, Rain cell descriptions.

Volume II of the three volumes constituted the final report on the rain statistics program. In this volume, the data reduction and analysis procedures were discussed along with the physical and statistical descriptors used. The statistical modeling techniques were outlined and examples of the derived statistical characterization of rain

cells in terms of the several physical descriptors were presented. Recommendations concerning analyses which can be pursued using the data base collected during the experiment were included. (See also W76-12178 and W76-12180) (Sims - ISWS)
W76-12179

RADAR DERIVED SPATIAL STATISTICS OF SUMMER RAIN - APPENDICES.
Johns Hopkins Univ., Laurel, Md. Applied Physics Lab.
Contractor Report NASA CR-2592, Vol. III of III, September 1975. 212 p, 4 append. NASA/DOD S-70248AG.

Descriptors: *Radar, *Virginia, *Rainfall, *Data processing, *Equipment, Electrical engineering, Calibrations, Antennas, Meteorology, Remote sensing, Measurement, Analytical techniques, Meteorological data, Weather data, Statistics.
Identifiers: *Radar-weather, *Wallops Island(Va), Radar-video processor, Radar calibrations, Frequency diversity.

Volume III, Appendices of the Final Report on rain statistics, is a collection of selected important memoranda written during the course of the experiment. The titles of memoranda are: (1) A Frequency Diversity Source Developed for Rain Statistics Program, (2) Technical Manual for Propagation Experiment Controller and Radar Video Processor, (3) SPANDAR Calibration Activities, and (4) Meteorological Summaries for Periods of SPANDAR Rain Observation May Through August 1973. (See also W76-12178 and W76-12179) (Sims - ISWS)
W76-12180

A STUDY OF THE UTILIZATION OF ERTS-1 DATA FROM THE WABASH RIVER BASIN,
Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
D. A. Landgrebe.
Available from the National Technical Information Service, Springfield, Va 22161 as N75-27 522, $10.50 in paper copy, $3.00 in microfiche. LARS Informative Note 052375, Final Report, August 1974. 337 p, 93 fig, 54 tab, 15 ref. NASA NAS5-21773.

Descriptors: *Remote sensing, *Illinois, *Indiana, *Missouri, *Idaho, *Kansas, *Wisconsin, *Satellites(Artificial), *Data processing, Mapping, Crops, Agriculture, Soils, Soil classification, Land use, Land classification, Urbanization, Water resources, Surface waters, Lakes, Rivers, Land resources, Vegetation, Equations, Forests, Aerial photography, Analytical techniques.
Identifiers: *ERTS, Chicago(Ill), Gary(Ind), *Lake Freeman(Ind), *Lake Shafer(Ind), Milwaukee(Wis), Finney County(Kan), Tippecanoe County(Ind), Marion County(Ind), White County(Ind), Indianapolis(Ind), Cook County(Ill), Milwaukee County(Wis), *Wabash River Basin.

The general objectives were: (1) to evaluate the applications of ERTS-1 measurements which have been appropriately reduced for use in specific earth resources problems, and (2) to determine the desirable measurements needed in future earth resources systems. Five scientific investigations were reported which were pursued to evaluate the applications of ERTS-1 measurements to specific earth resources problems. To further support these objectives, four specific supporting technology tasks were also included. The nine tasks were all based on the use of digital computer techniques for studying ERTS data in digital form. The conclusions for this study were numerous and were included in each of the nine sections describing results for each project. The overall conclusions were that ERTS-1 data shows potential for crop mapping, urban land use mapping, and water resources mapping. Less favorable results were observed for soil association mapping and earth surface features identification; however these studies were limited in scope. (Sims -ISWS)
W76-12183

STUDY OF THE LOWER STRATOSPHERIC THERMAL STRUCTURE AND TOTAL OZONE FROM NIMBUS-4 IRIS,
National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center.
For primary bibliographic entry see Field 2B.
W76-12184

RAINFALL GENERATION: A NONSTATIONARY TIME-VARYING MULTIDIMENSIONAL MODEL,
Puerto Rico Univ., Mayaguez. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2B.
W76-12208

BASIC REMOTE SENSING INVESTIGATIONS FOR BEACH RECONNAISSANCE: AN INTERIM REPORT,
Environmental Research Inst. of Michigan, Ann Arbor.
For primary bibliographic entry see Field 2L.
W76-12375

SELF-MONITORING PROCEDURES: BASIC LABORATORY SKILLS (164.6) STUDENT REFERENCE MANUAL,
Charles County Community Coll., La Plata, Md.
For primary bibliographic entry see Field 5A.
W76-12377

REMOTE SENSING OF MARINE HYDROCARBON SEEPS,
Barringer Research Ltd., Rexdale (Ontario). (Assignee).
For primary bibliographic entry see Field 5A.
W76-12411

INFLUENCE OF SURFACE WAVES ON SUBSURFACE CURRENT MEASUREMENTS IN SHALLOW WATER,
National Oceanic and Atmospheric Administration, Seattle, Wash. Pacific Marine Environmental Lab.
For primary bibliographic entry see Field 2L.
W76-12431

A SLUG TEST FOR DETERMINING HYDRAULIC CONDUCTIVITY OF UNCONFINED AQUIFERS WITH COMPLETELY OR PARTIALLY PENETRATING WELLS,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
For primary bibliographic entry see Field 2F.
W76-12432

REMOTE SENSING OF MISSISSIPPI RIVER CHARACTERISTICS,
Colorado State Univ., Fort Collins, Dept. of Civil Engineering.
J. F. Ruff, M. M. Skinner, B. R. Winkley, D. B. Simons, and D. E. Dorratcague.
Journal of the Waterways, Harbors and Coastal Engineering Division, American Society of Civil Engineers, Vol. 102, No. WW2, Proceedings Paper 12150, p 189-202, May 1976. 9 fig, 4 ref, 1 append.

Descriptors: *Remote sensing, *Aerial photography, *Rivers, *Mississippi River, *Infrared radiation, Photography, Sediments, Temperature, Aerial photography, Turbidity, Potamology, Sedimentology, Flow, Eddies, On-site investigations, Floods.
Identifiers: *Aerial infrared photography, *Thermal infrared imagery.

The Corps of Engineers, Vicksburg District, initiated a data collection program to develop a workable knowledge of the principles relating to the transport of water and sediment to gain a better understanding of the Mississippi River characteristics. Aerial photographs and thermal infrared imagery were collected over two test reaches at low and high water stages. Qualitative interpretation of the data related to the river characteristics such as flow patterns, relative velocities, sediment concentration distribution, water-depth effects, and effects of man-made structures. Ground truth information was correlated with the remotely sensed data. (Sims-ISWS)
W76-12442

CAPACITANCE SENSOR FOR SOIL MOISTURE MEASUREMENT,
State Univ. of New York at Buffalo.
For primary bibliographic entry see Field 2G.
W76-12457

NUCLEAR MAGNETIC RESONANCE SENSOR FOR MOISTURE MEASUREMENT IN ROADWAYS,
Southwest Research Inst., San Antonio, Tex.
For primary bibliographic entry see Field 2G.
W76-12458

INVESTIGATION OF FILTRATION CHARACTERISTICS OF A NONWOVEN FABRIC FILTER,
Marks-Rosen, Inc., Knoxville, Tenn.
For primary bibliographic entry see Field 2G.
W76-12459

AN IMPROVED IN SITU PH SENSOR FOR OCEANOGRAPHIC AND LIMNOLOGICAL APPLICATIONS,
California Univ., Los Angeles. Dept. of Geology
A. Ben-Yaakov, and E. Ruth.
Limnol Oceanogr. 19(1), 144-150,1974.

Descriptors: *Hydrogen ion concentration, Instrumentation, Oceanography, Limnology, Analytic techniques, Electrodes, Measurement.
Identifiers: *Carbonate saturometry, Ion selecti electrodes.

An improved in situ pH sensor and signal conditioner suggest that an accuracy of 0.02 pH can achieved and that ion selective electrodes can useful in situ experiments such as carbonate saturometry.--Copyright 1974, Biological Abstrac Inc.
W76-12479

7C. Evaluation, Processing and Publication

OPTIMIZATION OF REAL TIME DAILY OPERATION OF A MULTIPLE RESERVOIR SYSTEM,
California Univ., Los Angeles. Dept. of Engineering Systems.
For primary bibliographic entry see Field 4A.
W76-12155

ICE THICKNESS OBSERVATIONS, NORTH AMERICAN ARCTIC AND SUBARCTIC, 1970-71, 1971-72,
Cold Regions Research and Engineering Laboratory, Hanover, N. H.
For primary bibliographic entry see Field 2C.
W76-12182

A STUDY OF THE UTILIZATION OF ERTS DATA FROM THE WABASH RIVER BASIN,
Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
For primary bibliographic entry see Field 7B.

UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN

W76-12183

ATMOSPHERIC STRUCTURE AND VARIABILITY IN AREAS OF CONVECTIVE STORMS DETERMINED FROM 3-H RAWINSONDE DATA,
Texas A and M Univ., College Station. Center for Applied Geosciences.
For primary bibliographic entry see Field 2B.
W76-12185

CONTINUATION OF THE ARIZONA WATER INFORMATION SYSTEM (AWIS),
Arizona Univ., Tucson. Office of Arid Lands Studies.
For primary bibliographic entry see Field 10D.
W76-12216

WABASH RIVER SYSTEMS MODEL - TERMINAL REPORT PHASE I,
Purdue Univ., Lafayette, Ind. School of Civil Engineering.
For primary bibliographic entry see Field 4A.
W76-12220

DENTIFICATION AND MAPPING OF FISHING BANKS ON THE OUTER CONTINENTAL SHELF OF THE GULF OF MEXICO,
Bureau of Land Management, New Orleans, La.
For primary bibliographic entry see Field 6G.
W76-12228

HADOW LENGTH TABLES FOR LATITUDE 2 DEGREES NORTH,
Forest Service (USDA), Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 4A.
W76-12242

HADOW LENGTH TABLES FOR LATITUDE 0 DEGREES NORTH,
orest Service (USDA), Berkeley, Calif. Pacific outhwest Forest and Range Experiment Station.
or primary bibliographic entry see Field 4A.
/76-12243

HADOW LENGTH TABLES FOR LATITUDE DEGREES NORTH,
orest Service (USDA), Berkeley, Calif. Pacific outhwest Forest and Range Experiment Station.
or primary bibliographic entry see Field 4A.
76-12244

IADOW LENGTH TABLES FOR LATITUDE DEGREES NORTH,
orest Service (USDA), Berkeley, Calif. Pacific outhwest Forest and Range Experiment Station.
or primary bibliographic entry see Field 4A.
76-12245

IADOW LENGTH TABLES FOR LATITUDE DEGREES NORTH,
rest Service (USDA), Berkeley, Calif. Pacific uthwest Forest and Range Experiment Station.
r primary bibliographic entry see Field 4A.
76-12246

ADOW LENGTH TABLES FOR LATITUDE DEGREES NORTH,
rest Service (USDA), Berkeley, Calif. Pacific uthwest Forest and Range Experiment Station.
r primary bibliographic entry see Field 4A.
6-12247

ADOW LENGTH TABLES FOR LATITUDE DEGREES NORTH,
rest Service (USDA), Berkeley, Calif. Pacific thwest Forest and Range Experiment Station.

For primary bibliographic entry see Field 4A.
W76-12248

SHADOW LENGTH TABLES FOR LATITUDE 36 DEGREES NORTH,
Forest Service (USDA), Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 4A.
W76-12249

REGIONAL SIMULATION OF STREAMFLOW DATA,
North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering.
For primary bibliographic entry see Field 2A.
W76-12250

A STOCHASTIC MODEL FOR PREDICTING THE PROBABILITY DISTRIBUTION OF THE DISSOLVED-OXYGEN DEFICIT IN STREAMS,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 5B.
W76-12276

DIGITAL MODEL TO PREDICT EFFECTS OF PUMPING FROM THE ARIKAREE AQUIFER IN THE DWYER AREA, SOUTHEASTERN WYOMING,
Geological Survey, Cheyenne, Wyo.
For primary bibliographic entry see Field 4B.
W76-12277

SURFACE WATER AVAILABILITY, PICKENS COUNTY, ALABAMA,
Geological Survey, Tuscaloosa, Ala.
For primary bibliographic entry see Field 4A.
W76-12280

GUIDE TO THE AVAILABILITY OF HYDROLOGIC DATA, GREATER PITTSBURGH REGION, PENNSYLVANIA.
Geological Survey, Harrisburg, Pa.
R. M. Beall.
Open-file report 76-352, May 1976. 12 p, 1 plate, 33 ref.

Descriptors: *Basic data collections, *Hydrologic data, *Sites, *Maps, *Pennsylvania, Precipitation(Atmospheric), Temperature, Streamflow, Gaging stations, Stage-discharge relations, Water quality, Surface waters, Groundwater, Water levels.
Identifiers: *Pittsburgh region(Pa).

Active primary-collection sites for hydrologic data are shown on a map of the Greater Pittsburgh region (Allegheny, Armstrong, Beaver, Butler, Washington, and Westmoreland Counties in southwestern Pennsylvania). The sources of data--by publication or responsible agency--are described. Secondary data collection sites have not been shown on the map, but several agencies involved in this activity have been listed. Hydrologic data are collected at the following numbers of identified sites under the auspices of Federal, State, and interstate organizations: Precipitation or temperature 39, surface-water stage or discharge 82, surface-water quality 69, and ground-water levels 7. (Woodard-USGS)
W76-12282

PROPOSED CROSS-FLORIDA BARGE CANAL: WATER-QUALITY ASPECTS, WITH A SECTION ON WASTE-ASSIMILATIVE CAPACITY,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 5G.
W76-12283

QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1970: PARTS 12-16. NORTH PACIFIC SLOPE BASINS, ALASKA, AND HAWAII AND OTHER PACIFIC AREAS.
Geological Survey, Reston, Va.
Available from the Supt. of Documents, GPO, Washington, DC 20402, Price $4.70. Water-Supply Paper 2160, 1976. 501 p, 1 fig.

Descriptors: *Water quality, *Surface waters, *Sediment transport, *Water temperature, *Pacific Northwest U.S., Alaska, Hawaii, Basic data collections, Water analysis, Chemical analysis, Water chemistry, Physical properties, Particle size, Streamflow, Sampling, Sites.
Identifiers: *North Pacific Slope basins.

During the water year ending September 30, 1970, the Geological Survey maintained 285 stations on 205 streams in the North Pacific Slope basins, Alaska, and Hawaii and other Pacific areas, for the study of chemical and physical characteristics of surface water. Samples were collected daily and monthly at 158 of these locations for chemical-Quality studies. Samples also were collected less frequently at many other points. Water temperatures were measured continuously at 235 and daily at 23 stations. Daily water temperatures were measured at most of the stations at the time samples were collected for chemical quality or sediment content. So far as practicable, the water temperatures were taken at about the same time each day. Quantities of suspended sediment are reported for 47 stations during the year ending September 30, 1970. Sediment samples were collected one or more times daily at most stations, depending on the rate of flow and changes in stage of the stream. Particle-size distributions of sediments were determined at 12 stations. The stream discharge reported for a composite sample is usually the average of daily mean discharges for the composite period. The discharges reported in the tables of single analyses are either daily mean discharges or discharges obtained at the time samples were collected and computed from a stage-discharge relation or from a discharge measurement. (Woodard-USGS)
W76-12284

DEVELOPING A STATE WATER PLAN: GROUND-WATER CONDITIONS IN UTAH, SPRING OF 1976,
Geological Survey, Salt Lake City, Utah.
For primary bibliographic entry see Field 4B.
W76-12296

WATER-LEVEL CHANGES IN SOUTHWESTERN KANSAS, 1940-75,
Geological Survey, Lawrence, Kans.
For primary bibliographic entry see Field 4B.
W76-12297

MAPS SHOWING GROUND-WATER CONDITIONS IN THE HARQUAHALA PLAINS AREA, MARICOPA AND YUMA COUNTIES, ARIZONA--1975,
Geological Survey, Tucson, Ariz.
E. E. Denis.
Water-Resources Investigations 76-33 (open-file report), April 1976. 3 sheets, 3 maps, 6 ref.

Descriptors: *Groundwater resources, *Aquifer characteristics, *Water yield, *Water quality, *Maps, Water utilization, Irrigation, Water levels, Water level fluctuations, Water wells, Depth, Water table, Dissolved solids, Fluorides, *Arizona.
Identifiers: *Harquahala Plains area(Ariz), Maricopa County(Ariz), Yuma County(Ariz).

This 3-sheet map report describes ground-water hydrology and water quality in the Harquahala Plains area in Maricopa and Yuma Counties, Arizona. The map titles are: (1) Change in Water Level, December 1966 to January 1975, and Irrigated Area, 1974, (2) Well Depth and Depth to Water, 1975, and (3) Specific Conductance and

Fluoride Concentration, 1974. Deposits of high permeability and storage are discontinuous lenses of clay, silt, sand and gravel; the sand and gravel are the main water-yielding units. The deposits are from less than 300 feet thick near the mountain fronts to more than 1,200 feet thick in the central part of the area. Ground water generally is under water-table conditions but may be under artesian conditions in places. The long-term withdrawal of ground water has resulted in a general decline in water levels. Water-level declines for 1957-75 were more than 200 feet in all the wells in which depth to water was measured. In the Harquahala Plains area the dissolved-solids concentrations in ground water range from less than 500 to more than 800 mg/liter. (Woodard-USGS)
W76-12299

MAP OF OVERDIP SLOPES THAT CAN AFFECT LANDSLIDING IN ARMSTRONG COUNTY, PENNSYLVANIA,
Geological Survey, Harrisburg, Pa.
W. R. Kohl.
Available from Branch of Distribution, USGS 1200 S. Eads St. Arlington, VA 22202, $.75. Miscellaneous Field Studies Map MF-730, 1976. 1 sheet, 1 map, 8 fig, 1 tab, 8 ref.

Descriptors: *Landslides, *Slopes, *Maps, *Sites, *Pennsylvania, Erosion, Avalanches, Rock mechanics, Geology.
Identifiers: Armstrong County(Pa).

This map shows areas of overdip slopes in Armstrong County, Pa. A slope is 'overdip' where the hill slope is steeper than the inclination of the outcropping rock layers and both slope and layers dip in the same general direction. Symbolized on the map and accompanying explanation are overdip slopes where rock layers are inclined more than 40 feet per mile and areas where rock layers have a lesser degree of inclination or are horizontal. Not symbolized are areas where rock layers dipping more than 40 feet per mile crop out in flat land or on slopes that are not overdip. Localities typifying slope conditions are described. Overdip slopes are significant to the problem of landsliding because: (1) Jointed (fractured) rocks on an overdip slope have no built-in 'mechanical' resistance to downslope movement. (2) The dip of rock layers commonly causes groundwater to percolate to an overdip slope. Water may be the most significant factor in landsliding; the chief agent in lubrication and rock decomposition, as well as a contributor to weight of soil on the slope. The overdip-slope map is but one of a number of tools useful in defining areas where landslides may occur. Others include slope maps, geologic maps, and soil maps. (Woodard-USGS)
W76-12300

MESOSCALE SPATIAL AND TEMPORAL VARIATIONS OF WATER MASS CHARACTERISTICS IN THE CALIFORNIA CURRENT REGION OFF MONTEREY BAY IN 1973-1974,
Naval Postgraduate School, Monterey, Calif.
For primary bibliographic entry see Field 2L.
W76-12386

MESOSCALE COMPONENT OF THE GEOSTROPHIC FLOW AND ITS TEMPORAL AND SPATIAL VARIABILITY IN THE CALIFORNIA CURRENT OFF MONTEREY BAY IN 1973-74,
Naval Postgraduate School Monterey, Calif.
For primary bibliographic entry see Field 2L.
W76-12387

PLOT-DERIVED PARAMETERS FOR BASIN COMPUTATIONS,
Agricultural Research Service, Beltsville, Md. Hydrograph Lab.
For primary bibliographic entry see Field 2A.
W76-12438

ALLOWANCE FOR THE STOCHASTIC CHARACTER OF HYDROLOGICAL DATA IN WATER PROJECT DECISIONS,
National Water Authority, Budapest (Hungary). Engineering Secretariat.
For primary bibliographic entry see Field 7A.
W76-12439

A HIGH SIERRA PRECIPITATION MEASUREMENT PROGRAM, FINAL REPORT ON THE 1975 SEASON,
Atmospherics Inc., Fresno, Calif.
For primary bibliographic entry see Field 2B.
W76-12446

SATELLITE SNOW OBSERVATIONS AND SEASONAL STREAMFLOW FORECASTS,
National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center.
For primary bibliographic entry see Field 2C.
W76-12468

THE USE OF COMPUTER TECHNIQUES AND AUTOMATION FOR WATER RESOURCES SYSTEMS.
Economic Commission for Europe (UN), New York. Committee on Water Problems, Economic and Social Council.
For primary bibliographic entry see Field 6A.
W76-12535

PRESENT SITUATION AND TRENDS IN THE APPLICATION OF ADVANCED METHODS AND TECHNIQUES FOR WATER RESOURCES MANAGEMENT.
Economic Commission for Europe (UN), New York.
In: The Use of Computer Techniques and Automation for Water Resources Systems, Washington, D.C., 1974, Volume II. p 1-6. 8 ref.

Descriptors: *Water resources development, Computers, *Management, *Automation, Planning, Methodology, Design, Optimum development plans, Personnel, Economics, Social aspects, Europe, Operations, Forecasting, Monitoring, Water quality, River basins.

It is generally recognized that water resources management (as well as hydrology) is the least computerized of the physical sciences and technically advanced branches of industry. The existing lag in water management and automated control--explained in the past by the abundance, relative purity, and low cost of water in most industrialized countries--can no longer be justified today. The need to introduce computerized regional dispatching boards in regional control and management has been fully recognized in many ECE countries. This article considers some of the main points deemed important for the effective application of advanced techniques of management of water resources systems. Discussed are: (1) training of personnel for effective application of new tools of management; (2) planning and design of water resources systems with application of computers; (3) computerization and automation to rational operation of water resources systems; and (4) organization and institutional prerequisites for efficient application of computers and automation for water resources management. (See also W76-12535) (Bell-Cornell)
W76-12536

A QUANTITATIVE MODEL FOR THE PLANNING OF SURFACE WATER RESOURCES: USE OF MIXED VARIABLE LINEAR PROGRAMMING,
Ardour-Garonne Agency, Toulouse (France), Programming Group.
For primary bibliographic entry see Field 4A.
W76-12546

RIVER SYSTEM MODELLING FOR OPERATIONAL FORECASTING,
National Weather Service, Silver Spring, Md. Hydrologic Research and Development Lab.
For primary bibliographic entry see Field 4A.
W76-12550

USE OF OPTIMIZATION MODELS FO WATER RESOURCES ALLOCATION AN CHOICE OF INVESTMENTS BY MEANS O COMPUTERS,
Research and Design Inst. for Water Resource Engineering, Bucharest (Rumania). Water Econ my Section.
For primary bibliographic entry see Field 6A.
W76-12558

USE OF INVESTMENT MODELS AND CHOIC OF ALTERNATIVE DECISIONS FOR THE O TIMUM DISTRIBUTION OF WATE RESOURCES AT THE STAGE OF PLANNIN BY MEANS OF COMPUTERS,
Vsesoyuznyi Nauchno-Issledovatelskii Insti Gidrotekhniki i Melioratsii, Moscow (USSR).
For primary bibliographic entry see Field 6A.
W76-12561

COMPUTER APPLICATION IN PROCESSIN TECHNICAL AND ECONOMIC DATA FOR O TIMIZING COMPLEX WATER RESOURC SYSTEMS,
Belorussian Central Research Inst. for Wa resources, Minsk.
For primary bibliographic entry see Field 6A.
W76-12565

FLOOD HAZARD ANALYSES FOR LOW MARSH CREEK (INCLUDING SELECT TRIBUTARIES), BANNOCK COUNTY, IDAH
Soil Conservation Service, Boise, Idaho.
For primary bibliographic entry see Field 4A.
W76-12580

CLARKS CREEK FLOOD PLAIN STU CATAWBA COUNTY, NORTH CAROLINA.
Soil Conservation Service, Raleigh, N. C.
For primary bibliographic entry see Field 4A.
W76-12582

FLOOD HAZARD ANALYSES REPORT: EA BRANCH NIMISHILLEN CREEK, STA COUNTY, OHIO.
Soil Conservation Service, Columbus, Ohio.
For primary bibliographic entry see Field 4A.
W76-12586

MULTIPURPOSE COMPUTER FOR T HONOLULU BOARD OF WATER SUPPLY,
Beck (R. W.) and Associates, Seattle, Wash.
For primary bibliographic entry see Field 4B.
W76-12589

FLOOD HAZARD INFORMATION: BACKL CREEK, VIOLET TOWNSHIP, FAIRFI COUNTY, OHIO.
Army Engineer District, Huntington, W. Va.
For primary bibliographic entry see Field 4A.
W76-12592

FLOOD PLAIN INFORMATION: FRE WATER CREEK, HUMBOLDT COUN CALIFORNIA.
Army Engineer District, San Francisco, Calif.
For primary bibliographic entry see Field 4A.
W76-12593

FLOOD PLAIN INFORMATION: YELLOW RIVER, PART III, METROPOLITAN ATLANTA, GEORGIA.
Army Engineer District, Savannah, Ga.
For primary bibliographic entry see Field 4A.
W76-12595

8. ENGINEERING WORKS

8A. Structures

COASTAL ENGINEERING CONFERENCE. FOURTEENTH. PROCEEDINGS. COPENHAGEN, DENMARK, JUNE 24-28, 1974.
American Society of Civil Engineers, New York.
For primary bibliographic entry see Field 5G.
W76-12221

OCEAN 72, IEEE INTERNATIONAL CONFERENCE ON ENGINEERING IN THE OCEAN.
Institute of Electrical and Electronics Engineers, Inc., New York.
For primary bibliographic entry see Field 5G.
W76-12224

STUDY OF THE EFFECTS OF STREAM CHANNELIZATION AND BANK STABILIZATION ON WARMWATER SPORT FISH IN IOWA: SUBPROJECT 5: EFFECTS OF LONG-REACH STREAM CHANNELIZATION ON DISTRIBUTION AND ABUNDANCE OF FISHES,
Iowa Cooperative Fishery Unit, Ames.
For primary bibliographic entry see Field 4C.
W76-12230

STUDY OF THE EFFECTS OF STREAM CHANNELIZATION AND BANK STABILIZATION ON WARMWATER SPORT FISH IN IOWA: SUBPROJECT 4: THE EFFECTS OF LONGREACH CHANNELIZATION ON HABITAT AND INVERTEBRATE IN SOME IOWA STREAMS,
Iowa Cooperative Fishery Unit, Ames.
For primary bibliographic entry see Field 4C.
W76-12231

STUDY OF THE EFFECTS OF STREAM CHANNELIZATION AND BANK STABILIZATION ON WARMWATER SPORT FISH IN IOWA: SUBPROJECT NO. 3 SOME EFFECTS OF SHORT-REACH CHANNELIZATION ON FISH AND FISH FOOD ORGANISMS, IN CENTRAL IOWA WARM WATER STREAM,
Iowa Cooperative Fishery Unit, Ames.
For primary bibliographic entry see Field 4C.
W76-12232

STUDY OF THE EFFECTS OF STREAM CHANNELIZATION AND BANK STABILIZATION ON WARMWATER SPORT FISH IN IOWA: SUBPROJECT 2. A STUDY OF THE IMPACT OF SELECTED BANK STABILIZATION STRUCTURES ON GAME FISH AND ASSOCIATED ORGANISMS,
Iowa Cooperative Fishery Unit, Ames.
For primary bibliographic entry see Field 4C.
W76-12233

STUDY OF THE EFFECTS OF STREAM CHANNELIZATION AND BANK STABILIZATION ON WARM WATER SPORT FISH IN IOWA: SUBPROJECT I INVENTORY OF MAJOR STREAM ALTERATIONS IN IOWA,
Iowa Cooperative Fishery Unit, Ames.
For primary bibliographic entry see Field 4C.
W76-12234

STRUCTURAL MODEL STUDIES FOR THE HENDRIK VERWOERD DAM,
Wimpey (George) and Co. Ltd., Hayes (England). Wimpey Central Lab.
J. C. Chapman, B. Creber, and P. J. D. Guile.
The Institution of Civil Engineers, Proceedings, Part 2, Research and Theory, Vol 57, p 467-491, September 1974. 22 fig, 1 tab.

Descriptors: *Dams, *Model studies, *Structural models, *Stress analysis, Design, Behavior, Instrumentation, Spillways, Culverts, Gravity, Hydrostatic pressure.
Identifiers: Stress distribution.

The Hendrik Verwoerd Dam has a crest length of 3000 ft with a maximum height of 280 ft, and a storage capacity of 5 million acre feet. The main purpose of the model analysis was to determine the stress distribution in the control structures incorporated in the dam, but because it was found necessary to model the complete dam, much information was also obtained concerning the structural behavior of the dam at working load and at various overload conditions up to failure. The model was built of concrete to a scale of one to a hundred. Gravity load was applied within the body of the dam by vertical wires loaded by hydraulic jacks below the model. The behavior of the model dam under design load was satisfactory and the stresses were of the anticipated order of magnitude; the stresses showed good agreement with the results of a finite element analysis. The vertical tensile stresses in the spillway culvert walls were higher than those which had been estimated by simple calculation. This is due to the effect of the arch thrusts acting on the control structures and it was this effect that the model was particularly designed to study. The results of the model analysis indicated that substantial reinforcement was required in the walls between the spillway culverts to resist the tensile stresses. (Bell-Cornell)
W76-12523

8B. Hydraulics

PLANNING THE LOCATION AND CAPACITY OF FLOOD CONTROL STRUCTURES,
Cornell Univ., Ithaca, N. Y. Coll. of Engineering.
For primary bibliographic entry see Field 4A.
W76-12156

SUPERCRITICAL FLOW AT OPEN-CHANNEL JUNCTIONS; HYDRAULIC MODEL INVESTIGATION,
Army Engineer District, Los Angeles, Calif.
D. A. Barela.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A014 892, $6.75 in paper copy, $3.00 in microfiche. Report No. 2-100, July 1975. 161 p, 55 photo, 42 plate, 1 tab.

Descriptors: *Open channels, *Junctions, *Supercritical flow, *Model studies, Hydraulic models, Channels, Channel flow, Channel improvement, Turbulence, Waves(Water), Flow, Open channel flow, Structures, Drainage, Drainage systems, Storm drains, Civil engineering, Hydraulics, *California.
Identifiers: *Los Angeles area(Calif), Structure design.

Hydraulic model tests made to generalize and verify the hydraulic design of confluence structures are described. Model investigation of certain confluences showed unsatisfactory flow conditions involving considerable turbulence in the confluence structure and transverse waves in the channel downstream. Major changes in particular designs were effected. Various schemes were introduced in each case. Lengthening the transition downstream from divider wall and minimal angle of intersection of the two channels were found to be the most efficient solutions. (Sims - ISWS)
W76-12187

A LABORATORY EVALUATION OF TRASH RACKS FOR DROP INLETS,
Agricultural Research Service, Stillwater, Okla.
G. C. Hebaus, and W. R. Gwinn.
Technical Bulletin No. 1506, September 1975. 70 p, 76 fig, 24 tab, 2 ref, 1 append.

Descriptors: *Trash racks, *Hydraulic structures, *Hydraulic models, *Spillways, Intakes, Model studies, Laboratory tests, Prototype tests, Testing, Reservoirs, Evaluation, Detention reservoirs.
Identifiers: Drop inlets, Closed conduit spillways.

Performance tests for trash racks on closed-conduit spillways, using one-eighth-scale models, were developed and standardized by comparison with the performance of full-scale prototype structures mounted on a drop inlet to a 2-foot-diameter conduit. Flow data for use in spillway design were collected by testing models and prototypes of standard and experimental designs under a range of flow conditions, with clear water and standardized trash loads. The following recommendations were made: for two-way drop inlets in open water, there should be a rack with a solid plate and a solid skirt extending below the inlet crest level. Ventilation must be provided between the plate and skirt so that siphoning will not occur, unless such action is desired. If the vent is made by leaving an open space between the underside of the plate and the top of the skirt, this open space should be covered with mesh to prevent the entry of sticks. Rack bars should be placed in a plane sloping downward from the bottom edge of the skirt to the side of the drop inlet, to prevent rigid trash, floating alongside the drop inlet at low water, from rising with the water and entering the space between the skirt and the drop inlet side. The rack on the four-way square drop inlet performed well. However, if a rack of this type is used, a mesh-covered ventilation space between the skirt and the plate should be provided. The racks investigated in this study were generally best suited for open-water installations. (Humphreys - ISWS)
W76-12189

MASS TRANSPORT IN GRAVITY WAVES ON A SLOPING BOTTOM,
Technische Hogeschool, Delft (Netherlands). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2L.
W76-12190

APPLICABILITY OF UNIT STREAM POWER EQUATION,
Army Engineer District, Chicago, Ill.
For primary bibliographic entry see Field 2J.
W76-12193

DISCHARGE PREDICTION, PRESENT AND FORMER, FROM CHANNEL DIMENSIONS,
Wisconsin Univ., Madison. Dept. of Geography.
For primary bibliographic entry see Field 2E.
W76-12198

THERMAL ANALYSIS OF FROZEN EMBANKMENT ISLANDS,
Puget Sound Naval Shipyard, Bremerton, Wash.
For primary bibliographic entry see Field 2L.
W76-12200

INCREASING THE MEAN CURRENT IN COASTAL CHANNELS,
Rosenstiel School of Marine and Atmospheric Science, Miami, Fla.
For primary bibliographic entry see Field 2L.
W76-12201

SEA LEVEL COMPUTATIONS OF THE BALTIC WITH A 20-CANAL MODEL,
Fishery Board of Sweden, Goteborg. Hydrographic Dept.
For primary bibliographic entry see Field 2L.

W76-12205

PROPOSED CROSS-FLORIDA BARGE CANAL: WATER-QUALITY ASPECTS, WITH A SECTION ON WASTE-ASSIMILATIVE CAPACITY,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 5G.
W76-12283

FLOOD DISCHARGE OF STREAMS IN NEW MEXICO AS RELATED TO CHANNEL GEOMETRY,
Geological Survey, Albuquerque, N. Mex.
For primary bibliographic entry see Field 2E.
W76-12294

AN ANALYSIS OF THE NUMERICAL SOLUTION OF THE TRANSPORT EQUATION,
Princeton Univ., N. J. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W76-12434

INTERACTION OF WATER WAVES WITH CYLINDER BARRIER,
Polish Academy of Sciences, Gdansk. Inst. of Hydraulic Research.
S. R. Massel.
Journal of the Waterways, Harbors and Coastal Engineering Division, American Society of Civil Engineers, Vol. 102, No. WW2, Proceedings Paper 12125, p 165-187, May 1976. 11 fig, 23 ref, 5 append.

Descriptors: *Waves(Water), Hydrodynamics, *Drag, *Coastal structures, Coastal engineering, Analysis, Barriers, Equations, Mathematical studies, Pressure, Velocity.
Identifiers: *Wave forces, *Circular cylinders, Inertia, Mathematical analysis, Diffraction, Transmission coefficient.

The spatial periodic function was used in the investigation of the interaction of water waves with a row of evenly spaced vertical cylinders. The direction of the incident waves was arbitrary. The effect of the neighboring cylinders on the wave force on a given cylinder was derived. The equivalent mass coefficients were calculated. The theoretical results were compared with previous experimental results on the inertia-predominant wave force and on the transmission coefficient for the barrier. (Adams-ISWS)
W76-12441

WAVE FORCES ON VERTICAL CIRCULAR CYLINDER,
Chicago Bridge and Iron Co., Plainfield, Ill. Marine Research and Development.
S. K. Chakrabarti, A. L. Wolbert, and W. A. Tam.
Journal of the Waterways, Harbors and Coastal Engineering Division, American Society of Civil Engineers, Vol. 102, No. WW2, Proceedings Paper 12140, p 203-221, May 1976. 11 fig, 1 tab, 11 ref, 2 append.

Descriptors: *Hydrodynamics, *Drag, *Frequency, *Laboratory tests, Waves(Water), Analysis, Froude number, Reynolds number, Hydraulic similitude, Coastal structures, Model studies, Equations, Mathematical studies.
Identifiers: *Wave forces, Inertia, Lift, *Circular cylinders.

Tests were conducted at Reynolds numbers less than 30,000. Hydrodynamic parameters, inertia, drag, and lift coefficients were calculated from the measured force data. Coefficient values obtained for 1 ft sections were used to correlate the measured forces on the entire cylinder. The coefficients correlated well with the period parameter which followed the Froude scale. Resultant forces were found to be as much as 60% higher than the in-line force. Lift coefficients were calculated to the fifth harmonic as functions of the period parameter. The frequencies of the lift force were found to have a definite trend with the number of eddies formed, which depended on the period parameter. Dependence on the period parameter made scaling to other sizes straightforward except for uncertain effects from changing the Reynolds number from subscritical to supercritical. (Adams-ISWS)
W76-12443

THE DEPTH VS. DEPTH PLOT: AN AID TO SELECTING PIEZOMETER INSTALLATION DEPTHS IN BOREHOLES,
Piteau Gadsby Macleod Ltd. North Vancouver (British Columbia).
R. C. Dick.
Engineering Geology, Vol. 10, No. 1, p 37-42, May 1976. 5 fig, 2 ref.

Descriptors: *Depth, *Graphical methods, *Piezometers, *Boreholes, *Stability, Slope stability, Soil water, Soil pressure, Artesian aquifers, Water table, Permeability, Water pressure, Potentiometric level, Reservoir leakage, Water level fluctuations, Perched water, Groundwater.
Identifiers: Anomalies.

The location of the piezometric surface within a soil or rock mass is often the critical factor in stability analysis and in evaluations of reservoir water-tightness. Sealed piezometers are now almost universally used to measure water pressure within the mass. The location of these piezometers must be decided immediately upon completion of each borehole. A common aid to making this decision is a plot of borehole depth and borehole water level as functions of time. This paper introduced another way to evaluate the same data, with the borehole water depth plotted as a function of borehole depth. Anomalies can be detected more easily, and piezometers installed within these zones. Examples were given. (Visocky - ISWS)
W76-12447

ANALYTIC SOLUTIONS FOR DETERMINING NATURALLY FRACTURED RESERVOIR PROPERTIES BY WELL TESTING,
Instituto Mexicano del Petroleo, Mexico City.
A. O. de Swaan.
Society of Petroleum Engineers Journal, Vol. 16, No. 3, p 117-122, June 1976. 3 fig, 1 tab, 10 ref, append.

Descriptors: *Mathematical models, *Fracture permeability, *Oil reservoirs, *Compressible flow, Equations, Pressure, Drawdown, Hydraulic properties, Porosity, Flow, Graphical methods, Diffusivity, Porous media.
Identifiers: *Matrix blocks, Well testing.

A completely unsteady-state theory was developed that described the well pressure response of infinite, naturally fractured reservoirs of the type composed by high-permeability fractures and tight matrix blocks. The theory exclusively involved flow properties and dimensions of the fractures and the matrix blocks; no extra adjusting parameters were needed for predicting the pressure response of a reservoir with known properties. Comparison of computed pressure-drawdown theoretical curves with results of a numerical model applied to idealized reservoirs showed a good fit. It was concluded that an evaluation of the following reservoir properties is possible from well-test pressure plots: the fractures' kh product and the average product of the matrix porosity by a characteristic dimension of the matrix blocks. Thus, the model allowed comparison of well-test pressure response with the formation measurements. (Visocky - ISWS)
W76-12449

OPTIMIZATION OF DESIGN CAPACITY O AN AQUEDUCT,
California Univ., Berkeley. Lawrence Berkel Lab.
For primary bibliographic entry see Field 4A.
W76-12526

BAYESIAN APPROACH TO TILE DRA DESIGN,
Ecole Polytechnique Federale de Lausan (Switzerland). Dept. of Agriculture.
A. Musy, and L. Duckstein.
Journal of the Irrigation and Drainage Divisi Proceedings of the American Society of Civil E gineers, Vol 102, No IR3, p 317-334, Septemb 1976. 7 fig, 3 tab, 30 ref.

Descriptors: *Tile drainage, *Land reclamati *Decision making, Agricultural engineeri Design, Water management(Applied), Hydrolo Equations, Economics, Costs, Systems analy Methodology, Crops, Evaluation, Optimizati *Tile drains, Risks.
Identifiers: *Bayes theorem, *Decision theo *Uncertainty principle, Systems engineeri Probability theory.

Economic and sociopolitical aspects of land re mation in areas that necessitate drainage are co bined with technical problems to yield a set possible decisions, among which an optim design is chosen. The loss or objective functio the sum of the expected damage caused by submersion of given crops resulting from extre rainfall events, and the initial cost of the recla tion. When the parameter uncertainty in the pro bility distribution function of extreme event taken into account in the loss function, a Ba risk function is obtained. The Bayes decis theoretic (BDT) approach consists of seekin decision that minimizes the Bayes risk funct The BDT also evaluates the decision taken compares the expected cost of delaying the c struction to the worth of additional informa resulting from such a delay. The practical exam of an intensive agricultural system with diffe types of soils and crops illustrates the method gy. Crop loss functions and probability distr tions of events are assumed on the basis of emp cal observations. (Bell-Cornell)
W76-12527

PROFESSIONAL REQUIREMENTS MODERN WATER ENGINEERS INVOLVED RIVER BASIN MANAGEMENT UTILIZ CONTEMPORARY TOOLS,
Bureau of Reclamation, Sacramento, Calif. Pacific Regional Office.
For primary bibliographic entry see Field 4A.
W76-12537

DYNAMIC PROGRAMMING FOR DET MINATION OF A STORM WATER OUT SYSTEM OF PIPES AND FLOOD-DAMP DAMS,
Societe Grenobloise d'Etude et d' Applicat Hydrauliques (France).
For primary bibliographic entry see Field 4A.
W76-12542

SEWER LAYING SYSTEM,
W. R. Brown.
United States Patent 3,956,901. Issued May 1976. Official Gazette of the United States Pa Office, Vol. 946, No. 3, p 994, May, 1976. 1 fig

Descriptors: *Patents, *Construction equipm *Sewers, *Pipelines, *Tiles, Conduits, veyance structures, Engineering structures.

A patent for a tile carrying and service device for laying sewer systems is described. The de consists of the following components: a ch with wheels, pipe handling bays situated on

side of the chassis, platforms in the pipe bays for support of the tiles, a means for conveying the tiles which are discharged transversely from the pipe bay platforms to a point distally from the chassis, a lift means for the platforms, and a means for discharging individual tiles from the pipe bays. (Kreager-FIRL)
W76-12605

WASTEWATER COLLECTION, (LITERATURE REVIEW),
Nottingham (H. D.) and Associates, Inc., McLean, Va.
For primary bibliographic entry see Field 5D.
W76-12631

8C. Hydraulic Machinery

WARM WATER STREAM ALTERATION IN IOWA: EXTENT, EFFECTS ON HABITAT, FISH, AND FISH FOOD, AND EVALUATION OF STREAM IMPROVEMENT STRUCTURES (SUMMARY REPORT),
Iowa Cooperative Fishery Unit, Ames.
For primary bibliographic entry see Field 4C.
W76-12235

TIDE-POWERED ELECTRICAL GENERATOR,
F. V. Rusby.
U. S. Patent No. 3,959,663, 4 p, 3 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 946, No 4, p 1886, May 25, 1976.

Descriptors: *Patents, *Energy conversion, Energy transfer, *Tidal energy, *Tidal water, Tidal powerplants, Engineering structures, Electric powerplants, Generators, Storage.
Identifiers: Jack bars, Weights.

A tide-powered electrical generator is described in which the energy from successive rising tides is stored in the form of potential energy for selective conversion to electricity. A float is constrained to vertical motion and it raises on successive tides a weight by means of a jack bar to reach a maximum predetermined height on a stable support structure where the weight is supported until release for the generation of electricity. Provision is made for the prevention of damage to the generator by excessive tidal rises. (Sinha - OEIS)
W76-12403

SUBMERSIBLE PUMPS UPGRADE SEWAGE HANDLING.
For primary bibliographic entry see Field 5D.
W76-12614

WASTEWATER COLLECTION, (LITERATURE REVIEW),
Nottingham (H. D.) and Associates, Inc., McLean, Va.
For primary bibliographic entry see Field 5D.
W76-12631

ALBUQUERQUE PLANT DESIGNED WITH COMPUTER IN MIND,
William Matotan and Associates, Albuerque, New Mex.
For primary bibliographic entry see Field 5D.
W76-12638

8D. Soil Mechanics

EFFECT OF SEEPAGE ON EMBANKMENT DEFORMATIONS DUE TO WATER LOADING,
Sydney Univ. (Australia). School of Civil Engineering.
For primary bibliographic entry see Field 4A.
W76-12188

ENGINEERING PROPERTIES OF COMPACTED CLAY CONDITIONED BY SATURATION AND FREEZE-THAW CYCLES,
Mobil Research and Development Corp., Dallas, Tex.
For primary bibliographic entry see Field 2C.
W76-12453

CASE STUDIES OF VARIATIONS IN SUBGRADE MOISTURE AND TEMPERATURE UNDER ROAD PAVEMENTS IN VIRGINIA,
Virginia Highway and Transportation Research Council, Charlottesville.
For primary bibliographic entry see Field 2C.
W76-12454

CAPACITANCE SENSOR FOR SOIL MOISTURE MEASUREMENT,
State Univ. of New York at Buffalo.
For primary bibliographic entry see Field 2G.
W76-12457

NUCLEAR MAGNETIC RESONANCE SENSORS FOR MOISTURE MEASUREMENT IN ROADWAYS,
Southwest Research Inst., San Antonio, Tex.
For primary bibliographic entry see Field 2G.
W76-12458

DETERMINATION OF DISPERSIVE CLAY SOIL ERODIBILITY BY USING A PHYSICAL TEST,
Texas Univ. at Arlington.
For primary bibliographic entry see Field 2G.
W76-12460

8E. Rock Mechanics and Geology

THE DEPTH VS. DEPTH PLOT: AN AID TO SELECTING PIEZOMETER INSTALLATION DEPTHS IN BOREHOLES,
Piteau Gadsby Macleod Ltd. North Vancouver (British Columbia).
For primary bibliographic entry see Field 8B.
W76-12447

8F. Concrete

PAVEMENT CRACKING IN WEST TEXAS DUE TO FREEZE-THAW CYCLING,
Texas A and M Univ., College Station. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2C.
W76-12452

EVALUATION OF PAVEMENT DRAINAGE SYSTEMS MADE OF LAYERS OF OPEN-GRADED BITUMINOUS AGGREGATE MIXTURES,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
S. D. Tayabji, and E. J. Barenberg.
In: Frost, Moisture, and Erosion; Transportation Research Record 532, Transportation Research Board, National Research Council, Washington, D. C., p 49-63, 1975. 5 fig, 10 tab, 10 ref.

Descriptors: *Road construction, *Paving, *Permeability, Roads, Highways, Bituminous materials, Drainage, Subsurface drainage, Laboratory tests, Soils, Clays, Soil properties, Civil engineering *Illinois.
Identifiers: *Pavements, Pavement drainage.

This study was aimed at evaluating the performance of pavement drainage systems in Illinois constructed with locally available aggregate sources. The study was limited to investigating the use of open-graded, hot-mixed bituminous aggregate mixtures in pavement drainage systems. A preliminary investigation was carried out in the laboratory to evaluate the permeability and the stability of the open-graded bituminous aggregate mixtures. Specimens were prepared according to the procedures in ASTM D1559. Permeability tests (in which a constant-head test that allowed the measurement of permeability at low heads was used) and stability tests were performed on the same specimen. From the results of the preliminary investigations, six test pavements incorporating different design concepts were tested at the University of Illinois test track. Dynamic loading was applied to the test pavements, and water was passed through the open-graded bituminous aggregate drainage layers to simulate surface and lateral infiltration. Permeability tests at a constant head were carried out regularly on the pavement test sections. The progress of rutting in the test pavements was also recorded. Results of these limited tests indicated that open-graded bituminous aggregate mixtures possess a high order of permeability and that care must be taken to prevent the migration of subgrade fines into these aggregate layers if satisfactory drainage is to be achieved. This paper discussed methods that can be used to ensure satisfactory performance of pavements made of open-graded aggregates. (See also W76-12451) (Sims-ISWS)
W76-12456

8G. Materials

HYGIENIC AND TOXICOLOGICAL EVALUATION OF SOME GRADES OF RUBBER USED IN DOMESTIC WATER SUPPLY SYSTEMS, (IN RUSSIAN),
Municipal Sanitary-Epidemiological Center, Moscow (USSR).
For primary bibliographic entry see Field 5C.
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EVALUATING A LOW-ENERGY, HIGH-VOLUME PUMP FOR ODOR REDUCTION FROM LIVESTOCK WASTE LAGOONS BY MIXING,
Oklahoma State University, Stillwater. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5G.
W76-12344

FROST, MOISTURE, AND EROSION.
Transportation Research Board, Washington, D. C.
For primary bibliographic entry see Field 2G.
W76-12451

EVALUATION OF PAVEMENT DRAINAGE SYSTEMS MADE OF LAYERS OF OPEN-GRADED BITUMINOUS AGGREGATE MIXTURES,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8F.
W76-12456

WATER SUPPLIES FROM ULSTER VALLEY GRAVELS,
Institute of Geological Sciences, London (England). Dept. of Hydrogeology.
For primary bibliographic entry see Field 4B.
W76-12524

ANTHRACITE ACTIVATED CARBONS: MANUFACTURE AND APPLICATIONS,
For primary bibliographic entry see Field 5D.
W76-12658

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9A. Education (Extramural)

OUTDOOR RECREATION PLANNING AND RESEARCH IN THE U.S.A.,
National Foundation for Scientific Research (NFWO), Ghent (Belgium).
For primary bibliographic entry see Field 6B.
W76-12585

9D. Grants, Contracts, and Research Act Allotments

1973-1974 SALINE WATER CONVERSION SUMMARY REPORT.
Office of Saline Water, Washington, D. C.
For primary bibliographic entry see Field 3A.
W76-12343

10. SCIENTIFIC AND TECHNICAL INFORMATION

10B. Reference and Retrieval

CONTINUATION OF THE ARIZONA WATER INFORMATION SYSTEM (AWIS),
Arizona Univ., Tucson. Office of Arid Lands Studies.
For primary bibliographic entry see Field 10D.
W76-12216

10C. Secondary Publication And Distribution

A REVIEW OF LITERATURE ON THE USE OF POTASSIUM PERMANGANATE (KMN04) IN FISHERIES,
Bureau of Sport Fisheries and Wildlife, Fayetteville, Ark. South Central Reservoir Investigations.
For primary bibliographic entry see Field 5C.
W76-12335

CHEMICALS AND ALLIED PRODUCTS (LITERATURE REVIEWS),
Union Carbide Corp., South Charleston, W. Va.
For primary bibliographic entry see Field 5D.
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PETROLEUM PROCESSING WASTES, (LITERATURE REVIEWS),
Weston (Roy F.), Inc., West Chester, Pa.
For primary bibliographic entry see Field 5D.
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URBAN RUNOFF AND COMBINED SEWER OVERFLOW, (LITERATURE REVIEW),
Environmental Protection Agency, Edison, N.J. Wastewater Research Div.
For primary bibliographic entry see Field 5D.
W76-12627

MICROBIOLOGY OF WASTE TREATMENT, (LITERATURE REVIEW),
Pennsylvania State Univ., University Park.
For primary bibliographic entry see Field 5D.
W76-12628

WASTEWATER TREATMENT - PHYSICAL AND CHEMICAL METHODS, (LITERATURE REVIEW),
Massachusetts Univ., Amherst. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W76-12629

SLUDGE TREATMENT, UTILIZATION, AND DISPOSAL, (LITERATURE REVIEW),
Delaware Univ., Dept. of Civil Engineering. Newark.
For primary bibliographic entry see Field 5D.
W76-12630

LAGOONS AND OXIDATION PONDS, (LITERATURE REVIEW),
Black and Veatch, Kansas City, Mo.
For primary bibliographic entry see Field 5D.
W76-12671

MIXING AND TRANSPORT, (LITERATURE REVIEW),
Argonne National Lab., Ill. Energy and Environmental Systems Div.
For primary bibliographic entry see Field 5B.
W76-12672

BIOLOGICAL FILTERS, (LITERATURE REVIEW),
National Environmental Research Center, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
For primary bibliographic entry see Field 5D.
W76-12674

10D. Specialized Information Center Services

CONTINUATION OF THE ARIZONA WATER INFORMATION SYSTEM (AWIS),
Arizona Univ., Tucson. Office of Arid Lands Studies.
K. E. Foster, and K. J. DeCook.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 560, $4.50 in paper copy, $3.00 in microfiche. Completion Report, (1975). 48 p, 2 tab, 6 ref, 4 append. OWRT A-031-ARIZ(2). 14-31-0001-5003.

Descriptors: *Data processing, *Data storage and retrieval, *Hydrologic data, Information retrieval, *Systems analysis, *Arizona, Information exchange, Water quality, Water supply, Groundwater, Watersheds(Basins), Data collections.
Identifiers: *Arizona Water Information System.

The Arizona Water Information System (AWIS) was developed for storage and retrieval of water resources data and for dissemination of water resources information pertaining to the State of Ariz. Collectively, the AWIS system contains a number of distinct elements. The Activity File is a listing of water resource activities and projects dating from 1961, which can be accessed by keywords or by agency to retrieve abstracts and information on approximately 1,000 projects; the file recently was updated and additional projects covered in a regional program pertaining to the Lower Colo. River Basin portions of Ariz., Calif., and Nev. A bimonthly Ariz. Water Resources News Bulletin and a companion Project Information Bulletin were initiated under this project and will be continued as a cooperative effort of the Ariz. Water Commission and the Univ. of Ariz. Water Resources Research Center and Office of Arid Lands Studies. A cassette-tape pilot series on Ariz. water trends also was produced and evaluated for use potential, which appears favorable. A western state conference on water information dissemination, sponsored by this project and the Office of Water Research and Technology, was held in Phoenix in 1973, to discuss the above kinds of activities in the several states and the possibilities for cooperative regional activities. The capacity for interactive hydrologic data processing, utilizing the DEC-10 computer system at the Univ. of Ariz., was developed in 1974 with the support of the Ariz. Water Commission (AWC). Groundwater and quality-of-water data furnished by AWC have been stored progressively in the system, and are retrievable by remote terminal through telephone hookup, by quarter-township grid location or by drainage basin.
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- Ground and surface water hydrology at the Illinois State Water Survey.
- Metropolitan water resources planning and management at the Center for Urban and Regional Studies of University of North Carolina.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Center of the University of Wisconsin.
- Eutrophication at the Water Resources Center of the University of Wisconsin.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.
- Water resource aspects of the pulp and paper industry at the Institute of Paper Chemistry.

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- Effect on water quality of irrigation return flows at the Department of Agricultural Engineering of Colorado State University.
- Agricultural livestock waste at East Central State College, Oklahoma.
- Municipal wastewater treatment technology at the Franklin Institute Research Laboratories.

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SELECTED WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center, Office of Water Research and Technology, U.S. Department of the Interior

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tion of the public business required by law of this Depart-
ment. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

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FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into 10 fields and 60 groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

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Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on the inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the Bio-Science Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
U.S. Department of the Interior
Washington, DC 20240

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03 WATER SUPPLY AUGMENTATION AND CONSERVATION
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05 WATER QUALITY MANAGEMENT AND PROTECTION
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SELECTED WATER RESOURCES ABSTRACTS

2. WATER CYCLE

2A. General

MATHEMATICAL MODEL FOR FLOOD-WAVE FORECASTING BY MEANS OF WARNING BASINS,
Institutul de Meteorologie si Hidrologie, Bucharest (Rumania).
For primary bibliographic entry see Field 4A.
W76-12829

THE SIMPLIFIED INTEGRAL MATHEMATICAL MODEL ON A SMALL LOW-LAND CATCHMENT,
Technical Univ. of Warsaw (Poland). Inst. of Environmental Engineering.
M. Ozga-Zielinska, and K. Krajewski.
Hydrological Sciences Bulletin, Vol. 21, No. 1, p 129-137, March 1976. 2 fig, 8 ref.

Descriptors: *Mathematical models, Mathematics, Infiltration, *Model studies, Evapotranspiration, *Basins, Hydrology, Seasonal, Groundwater movement, Groundwater flow, Snowmelt, Surface runoff, Winter, Structures, Summer, *Watersheds(Basins).
Identifiers: Lumped-parameter model.

A model was developed for a small lowland catchment considered to be homogeneous and consequently allowing the adoption of a lumped-parameter model. It incorporated all the most important hydrological processes occurring in the catchment: evapotranspiration, infiltration, groundwater flow, surface runoff, and snowmelt. Each of these processes was modelled separately; the parameters expressing the given process in descriptive terms resulted from the effect of the optimization of the functions with a specific objective. Nonstationarity of the system was taken into account by dividing the year into two periods, a winter and a summer season. The conditions of the run of some hydrological processes were highly variable and, consequently, the process of infiltration and surface runoff had been identified separately for each period on two occasions. (Roberts-ISWS)
W76-12831

MATHEMATICAL MODEL OF THE 'RESERVOIR' TYPE DESIGNED FOR FLOOD-WAVE MODELLING AND FORECASTING,
Institutul de Meteorologie si Hidrologie, Bucharest (Rumania).
I. Serban.
Hydrological Sciences Bulletin, Vol. 21, No. 1, p 139-147, March 1976. 3 fig, 3 tab, 4 ref.

Descriptors: *Mathematical models, *Reservoirs, Flood waves, *Forecasting, *Rainfall, Equations, Basins, Evaporation, Unit hydrographs, Evapotranspiration, Discharge(Water), Mathematical studies.
Identifiers: *Flood wave modelling, *Derived model, Discharge conversion, Modulation function, Production function, Discharge hydrograph, Model parameters, Model implementation, Conversion.

The mathematical model was derived to achieve the rainfall/discharge conversion by means of two individual equations: a production function and a modulation function. Through the production function, the rainfall, P, over a basin was converted into effective rainfall, which became available for runoff. The conversion was achieved by means of a number of reservoirs, NS, each of which could store a maximum amount of water. The total range of reservoir numbers was a parameter that had to be optimized. A parameter defined as the maximum storage capacity of the reservoir was introduced. Evaporation, E, from the first reservoir was taken as a potential value, and the evaporation of the second reservoir in the series was taken after the depletion of the first one and multiplied by a parameter CE, of value less than unity. When the second reservoir in turn became depleted, the rate of evaporation from the third one was taken as multiplied C(E squared), and so on. The potential evaporation was multiplied by a parameter RT and compared with rainfall. When the rainfall exceeded evaporation, runoff was supplied after seepage and reservoir capacity had been exceeded. The hyetograph of the effective rainfall was transformed into a duration discharge hydrograph by using a modulation unit hydrograph which was determined by the gamma distribution function. A continuous period of observations for at least five years was necessary. The observations included rainfall, evapotranspiration, and discharge estimates, excluding baseflow. (Roberts - ISWS)
W76-12979

AN ADAPTIVE IDENTIFICATION AND PREDICTION ALGORITHM FOR THE REAL-TIME FORECASTING OF HYDROLOGICAL TIME SERIES,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
A. Szollosi-Nagy.
Hydrological Sciences Bulletin, Vol. 21, No. 1, p 163-176, March 1976. 7 fig, 2 tab, 24 ref.

Descriptors: *Time series analysis, *Algorithms, *Forecasting, Hydrology, Equations, Mathematical studies, Stochastic processes, Computers, Water quality, Variability, Water resources development.
Identifiers: *Hydrological time series, *Real-time forecasting, Data window, Noise variance, Variance, Recursive algorithms, Sequential prediction.

The state space formulation of hydrological/water resources systems was outlined. Prediction algorithms were proposed which satisfied the requirements of suitable prediction schemes by using time domain formulation. These avoided the usual frequency-domain based computations, and the problem became mathematically tractable. Due to the recursiveness of the algorithms, the scheme was easily implemented even for small computers and was applicable for real-time on-line forecasting. An example was presented using simulated data. The results indicated the practical applicability of the proposed procedure. The procedure could be extended to include the identification/prediction of stochastic nonlinear hydrological systems, by augmenting the state vector with the ordinates of the higher order impulse responses, and then taking advantage of nonlinear filtering techniques. (Roberts - ISWS)
W76-12980

DATA ANALYSIS AND SYSTEM MODELLING IN URBAN CATCHMENT AREAS (IN THE NEW TOWN OF LELYSTAD, THE NETHERLANDS),
IJsselmeerpolders Development Authority, Lelystad (Netherlands). Scientific Div.
J. A. Van Den Berg.
Hydrological Sciences Bulletin, Vol. 21, No. 1, p 187-194, March 1976. 2 fig, 2 tab, 5 ref.

Descriptors: *Data processing, *Model studies, *Probability, Urban runoff, Precipitation, Sewers, Subsurface drainage, Groundwater, Equations, On-site data collections, Rainfall, Persistence.
Identifiers: *Data analysis, *Polders, *Lelystad(The Netherlands), *Zuiderzee, System modelling, Urban catchment areas, Sewer system, Probability distribution.

The new town of Lelystad, The Netherlands, had several catchment areas in its residential quarter, a parking lot, and the shopping and office center. These were located in recently reclaimed polders in the former Zuiderzee. Precipitation was the input; the discharges were the rainwater sewer system, the subsurface drainage system, and the groundwater level. Precipitation and discharges were continuously measured and automatically recorded. The objective was to determine the probability distribution of the outputs from the distribution of the input and from the deterministic operations which could be represented by a matrix. From these data, rainfall and discharge intensities were calculated for the periods of observation. Persistence, or autocorrelation, existed between these intensities when dry spells were disregarded. The first step in the data analysis was a deterministic approach, using the principle of input-response-output. The responses were environmental, producing the transformation of the input. This was demonstrated by precipitation values and inflow into storm water drains, the latter generated from outflow measurements by a deterministic relation. (Roberts - ISWS)
W76-12981

METHODOLOGY FOR THE SELECTION AND APPLICATION OF PROBABILITY MODELS FOR THE SIMULATION OF DAILY RAINFALL AND RUNOFF,
Purdue Univ., West Lafayette, Ind. School of Civil Engineering.
For primary bibliographic entry see Field 7A.
W76-12994

GROUND WATER MOVEMENT,
National Water Well Association, Worthington, Ohio.
For primary bibliographic entry see Field 4B.
W76-13031

FINITE-DIFFERENCE MODEL FOR AQUIFER SIMULATION IN TWO DIMENSIONS WITH RESULTS OF NUMERICAL EXPERIMENTS,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2F.
W76-13085

GEOMORPHOLOGY AND CLIMATOLOGY OF ARID WATERSHEDS,
Hebrew Univ., Jerusalem (Israel). Dept. of Geography.
A. P. Schick, and D. Sharon.
Hebrew University, Department of Geography, Final Bi-Annual Technical Report, September 1974. 162 p, 35 tab, 19 fig, 2 append.

Descriptors: *Geomorphology, *Climatology, *Watersheds(Basins), *Arid lands, *Terrain analysis, *Rainfall, Floods, Rainfall disposition, Rainfall intensity, Rainfall-runoff relationships, Bed load, Streamflow, Alluvial fans, Deposition(Sediments), Erosion, Hydrograph analysis.
Identifiers: Nahal Yael Research Watershed(Israel).

Environmental data have been collected and analyzed at the Nahal Yael Research Watershed in the Negev, Israel. The study of non-uniform fields associated with local convective processes was stressed in rainfall analysis. Records from a dense network were used to identify rain-producing cells along pre-frontal convergence lines or developing as air-mass storms. Most of the flood-producing rainfall in this region was from meso-scale connective storm cells. Such cells are usually well-separated during fall and spring months and so cover only parts of the land surface. Some 200 samples of suspended sediment collected in extremely arid watersheds were analyzed; bedload movement was found to be of major importance in the erosion and sedimentation process. Analysis of the rising limbs of flood hydrographs from Yael watersheds indicated a relationship between the duration of a rise to peak discharge, rainfall intensity, watershed infiltration and suspended sediment concentration. A sediment budget for the

Nahel Yael alluvial fan indicates net aggradation of about 1.5 cu m/year. The geologic structure of the watershed is summarized; surface flow in extreme desert terrain, streamflow and other related topics are discussed. (Jahns-Arizona)
W76-13135

2B. Precipitation

ATMOSPHERIC INPUT OF SOME CATIONS AND ANIONS TO FOREST ECOSYSTEMS IN NORTH CAROLINA AND TENNESSEE,
Forest Service (USDA), Franklin, N.C. Coweeta Hydrologic Lab.
For primary bibliographic entry see Field 2K.
W76-12838

AN OVERVIEW OF THE PRECIPITATION PROCESSING SYSTEM AT THE SOUTHWEST WATERSHED RESEARCH CENTER,
Agricultural Research Service, Tucson, Ariz. Southwest Watershed Research Center.
For primary bibliographic entry see Field 7C.
W76-13132

GEOMORPHOLOGY AND CLIMATOLOGY OF ARID WATERSHEDS,
Hebrew Univ., Jerusalem (Israel). Dept. of Geography.
For primary bibliographic entry see Field 2A.
W76-13135

COMPARISON STUDY OF MODELS USED TO PRESCRIBE HYDROMETEOR WATER CONTENT VALUES, PART I: PRELIMINARY RESULTS,
Air Force Cambridge Research Labs., Hanscom AFB, Mass.
R. M. Pierce, R. W. Lenhard, and B. D. Weiss.
Available from the National Technical Information Service, Springfield, Va 22161 as ADA-019 633, $3.50 in paper copy, $3.00 in microfiche. Report No. AFCRL-TR-75-0470, ERP No. 532, September 5, 1975. 20 p, 3 fig, 2 tab, 6 ref.

Descriptors: *Model studies, *Mathematical models, *Cloud physics, Analytical techniques, Atmosphere, Atmospheric physics, Clouds, Precipitation(Atmospheric), Rain, Snow, Ice, Meteorology.
Identifiers: *Liquid water content.

A preliminary study was made of several analytical techniques used to deduce profiles of integrated liquid water content (LWC). Comparison was made with aircraft and/or radar measurements for two sets of cases in order to determine if one or more of the modeling techniques would consistently yield more representative values than the others over a period of time. A brief description of the techniques used and the results of the statistical analyses applied to this study were presented. Also, a comparison of the integrated LWC for each case at the 10, 8, 6, 4 and 2 km and surface levels was presented in tabular form. Although it is possible to observe minor trends from this study, too few cases are presently available to reach any firm conclusion regarding the merits of one technique over any of the others. (Sims-ISWS)
W76-13172

THE CONTINUOUS ALUMINUM-FOIL HYDROMETEOR SAMPLER; DESIGN, OPERATION, DATA ANALYSIS PRECEDURES, AND OPERATING INSTRUCTIONS,
Air Force Cambridge Research Labs., Hanscom AFB, Mass.
J. F. Church, K. K. Pocs, and A. A. Spatola.
Available from the National Technical Information Service, Springfield, Va 22161 as AD/A-019 630, $4.50 in paper copy, $3.00 in microfiche. Report No. AFCRL-TR-75-0370, IP No. 235, July 11, 1975. 70 p, 27 fig, 5 tab, 49 ref, 1 append.

Descriptors: *Instrumentation, *Cloud physics, *Equipment, *Sampling, Aircraft, Snow, Ice, Rain, Precipitation(Atmospheric), Drops(Fluids), Raindrops, Atmospheric physics, Atmosphere, Clouds, Data processing, Design, Analytical techniques, Meteorology.
Identifiers: *Meteorological instrumentation, Foil hydrometeor samplers.

This study presented results of research done on the continuous aluminum-foil hydrometeor sampler which is an airborne meteorological instrument that uses a continuous ribbon of aluminum-foil which moves at a constant speed past a 14.51-cu cm (2.25-cu in) sampling area aperture exposing the foil to the ambient air-flow inflight. Both liquid drops greater than 100 micrometers and solid particles greater than 50 micrometers could be identified, measured, and counted. The frozen particles, depending upon orientation, impacted on the foil leaving an almost exact replica. However, the imprint size of liquid drops could be up to 30% greater when sampled on a C-130 aircraft, depending on the true air speed of the sampling. Knowing the true aircraft speed, the foil advance speed, aperture width, and the ratio of imprint to true size, the hydrometeor size distribution and mass concentration could be determined along the aircraft's sampling path. But in certain special meteorological conditions, the accuracy of the extracted data was subject to the skills and subjective interpretation of the analyst. The continuous aluminum-foil hydrometeor samplers were subject to supercooled icing problems which on occasion have rendered the instruments inoperative. Subsequent modifications to include greater heating capability for the shutter and the area around the sampling aperture were made and were described. (Sims-ISWS)
W76-13173

AN ANALYSIS OF THE ERRORS ASSOCIATED WITH THE DETERMINATION OF ATMOSPHERIC TEMPERATURE FROM ATMOSPHERIC PRESSURE AND DENSITY DATA,
National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center.
R. A. Minzner.
Report No. NASA TN D-8014, January 1976. 35 p, 8 fig, 6 ref, 1 append.

Descriptors: *Remote sensing, *Air temperature, *Density, *Graphical analysis, *Atmospheric pressure, Equations, Temperature, Height, Atmosphere, Atmospheric physics, Mathematics.
Identifiers: *Error analysis, Rocket soundings.

A graph was developed for relating delta T/T, the relative uncertainty in atmospheric temperature T, to delta p/p, the relative uncertainty in the atmospheric pressure p, for situations when T is derived from the slope of the pressure-height profile. A similar graph related delta T/T to delta rho/rho, the relative uncertainty in the atmospheric density rho, for those cases when T is derived from the downward integration of the density-height profile. A comparison of these two graphs showed that for equal uncertainties in the respective basic parameters, p or rho, smaller uncertainties in the derived temperatures are associated with density-height rather than with pressure-height data. The value of delta T/T was seen to depend not only upon delta p or delta rho, and to a small extent upon the value of T or the related scale height H, but also upon the inverse of Delta h, the height increment between successive observations of p or rho. In the case of pressure-height data, delta T/T was dominated by 1/Delta h for all values of Delta h; for density-height data, delta T/T was dominated by delta rho/rho, for Delta h smaller than about 5 km. Thus, while delta T/T = delta p/p for Delta h = (square root of 2) H, which is about 10 km, delta T/T increased to 10, 100, and 1000 times delta p/p as Delta h decreased successively to 1 km, 0.1 km, and 0.01 km respectively. In the case of T derived from density-height data, this inverse relationship between delta T/T and Delta h applied only for large values of Delta h, that is, for Delta h greater than 35 km. For Delta h less than 1 km, delta T/T was congruent to delta rho/rho, independent of the size of Delta h. No limit existed in the fineness of usable height resolution of T which may be derived from densities, while a fine height resolution in pressure-height data led to temperatures with unacceptably large uncertainties. (Sims-ISWS)
W76-13179

STUDIES ON NUMERICAL MODELING AND MODIFICATION OF CYCLONE SCALE PRECIPITATION,
Michigan Univ., Ann Arbor. Dept. of Atmospheric and Oceanic Science.
For primary bibliographic entry see Field 3B.
W76-13185

MESOMETEOROLOGICAL STUDIES OF PRECIPITATION,
Uppsala Univ. (Sweden). Dept. of Meteorology.
T. Bergeron, and B. Dahlstrom.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A022 484, $4.00 in paper copy, $3.00 in microfiche. Final Report 1973-75, December 31, 1975. 24 p, 8 fig, 3 tab, 16 ref, 1 append. Army DA-ERO-591-74-G0001.

Descriptors: *Precipitation(Atmospheric), *Rainfall, *Cloud physics, *Areal, Networks, Computers, Measurement, Equations, Weather patterns, Mathematical studies, On-site investigations, Meteorology.

The horizontal and vertical 'turbulence' and exchange set up and maintained by different macro-scale mechanisms (cyclones and anticyclones etc.) are well known. The role of convective air-mass clouds in this respect in the meso-scale has also been the subject of world-wide intense studies. As to the meso-scale study of apparently convective entities in the frontal and origenic cloud systems, on the other hand, much less has been done. Therefore, it was one aim of this study to shed some light on that problem. It was confirmed that even these cloud-systems generally show a markedly 'granulated' and partly convective structure of their precipitation pattern, at least down to details with a horizontal extension of about 5 km. Moreover, this study showed that even the frontal cloud systems, and their precipitation, mostly are divided into well detached cells or units of varied origin. It was concluded that their propagation offers several aspects of interest to weather forecasting and are worth further research. (Sims-ISWS)
W76-13186

2C. Snow, Ice, and Frost

ON THE CALCULATION OF SURFACE SHEAR STRESS USING THE PROFILE METHOD,
Geological Survey, Tacoma, Wash.
C. H. Ling.
Journal of Geophysical Research, Vol 81, No 15, p 2581-2582, May 20, 1976. 2 fig, 7 ref.

Descriptors: *Shear stress, *Surfaces, *Stress, *Ice loads, Methodology, Equations, Evaluation, Boundaries(Surfaces), Roughness(Hydraulic).

Comparison of shear stress calculations has been made between the conventional profile method and the method proposed by Ling and Untersteiner, 1974-by using the corrected drag plate measurements of the Kansas Field Program of 1968 made by the Air Force Cambridge Research Laboratories. A von Karman constant of 0.35 has been used for this comparison. The proposed method gives better stress estimates and less scatter in the roughness parameter than the conventional method. (See W74-05164) (Woodard-USGS)

CARLSON U. OF ILL. URBANA-CHAMPAIGN

W76-12809

CHANGES OCCURRING IN THE OCEANIC PORTION OF THE COLVILLE RIVER DELTA, ALASKA, DURING SPRING FLOODING,
Louisiana State Univ., Baton Rouge. Dept. of Geography and Anthropology; and Louisiana State Univ., Baton Rouge. Coastal Studies Inst.
H. J. Walker.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A009 031, $3.50 in paper copy, $3.00 in microfiche. Technical Report No. 181, March 1975. 8 p, 7 fig, 7 ref. Reprint from Proceedings, Second International Conference on Port and Ocean Engineering under Arctic Conditions, Reykjavik (Iceland), August 27-31, 1973, p 266-273. NR 388 002, ONR N00014-69-A-0211-0003.

Descriptors: *Deltas, *Rivers, *Floods, *Alaska, *Arctic, Spring, Interfaces, Saline water-freshwater interfaces, Sediments, Seasonal, Suspended solids, Permafrost, Snowmelt, Runoff, Salinity, Temperature, Water temperature, On-site investigations.
Identifiers: *Colville River Delta(Alaska), Spring flooding, Ice breakup.

The seawater which accumulates beneath the sea ice at the front of the Colville River delta during winter is replaced by fresh but turbid water during flooding accompanying breakup. The wedge that initially forms is very distinct, and the floodwater within it has relatively little influence on the salinity and temperature of the seawater beneath the interface. Data showed, however, that the suspended material transported seaward in the wedge settles through the interface and the seawater beneath the interface to be deposited on the bottom. (Sims-ISWS)
W76-12997

HEAT TRANSFER CHARACTERISTICS OF A BUBBLE-INDUCED WATER JET IMPINGING ON AN ICE SURFACE,
Cold Regions Research and Engineering Lab., Hanover, N.H., Research Div.
F-C. Yen.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A010 035, $3.50 in paper copy, $3.00 in microfiche. Research Report 335, April 1975. 16 p, 15 fig, 1 tab, 13 ref.

Descriptors: *Bubbles, *Ice, *Heat transfer, Jets, Ice-water interfaces, Deicers, Ice cover, Lake ice, Laboratory tests, Equipment, Instrumentation, Mathematics, Equations.
Identifiers: *Ice prevention, Ice formation, Ice control.

An experimental study of the heat transfer characteristics of a bubble-driven water jet on an ice surface was conducted. Two Lucite columns, one 0.829 m high and 0.286 m in diameter and the other 0.219 m high and 0.140 m in diameter were used. Water levels were maintained at 0.762 and 1.524 m in the large column and 0.840 m in the small column. Hypodermic needles with openings of 0.152, 0.406 and 0.838 mm were used for bubble formation. The air flow rate was varied from 7.39 x 10 to the minus 8th power to 9.91 x 10 to the minus 5th power cu m/s. In all, 171 experimental runs were conducted. The results can be correlated by Nu = 0.1735 (Re sub i) to the 0.848 power with a correlation coefficient of 0.84, in which Nu is defined in terms of average heat transfer coefficient, sample diameter, and thermal conductivity of water. Re sub i is defined in terms of diameter of the impinging water jet at the ice surface, the centerline arrival water velocity, and the kinematic viscosity of water. (Sims-ISWS)
W76-12998

STRESS CONCENTRATION IN SLOPING SNOWPACK FROM GEOMETRIC IMPERFECTIONS,
Montana State Univ., Bozeman. Dept. of Civil Engineering and Engineering Mechanics.
T. E. Lang, and R. L. Brown.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-022 425, $3.50 in paper copy, $3.00 in microfiche. Report No. ARO 11042.2-EN, 1975. 10 p, 8 fig, 7 ref. DA-ARO-D-31-124-73-G 175, NSF GA-3943.

Descriptors: *Snow cover, *Stress, *Creep, *Model studies, Mathematical models, Equations, Stress analysis, Snow, *Snowpacks, Shear, Shear stress, Slopes, Strain, Viscosity.
Identifiers: Viscoelastic properties.

Results were presented from developed equations on the prediction of the state of stress and creep in an idealized sloping snow slab perturbed by a basal layer shear imperfection. Stress and strain rate intensification, maximum energy loci, stress dependence on viscoelastic properties, and other related parametric evaluations were summarized. The dependence of these parameters on slope angle and size of imperfection was reported. (Sims-ISWS)
W76-13061

2D. Evaporation and Transpiration

STUDIES ON THE POTENTIAL EVAPORATION OF LAWNS UNDER DIFFERENT CONDITIONS OF UNDERGROUND WATER: A COMPARISON OF CALCULATED VALUES WITH THE VALUES OF A LYSIMETER, (IN GERMAN),
Technische Universitaet, Hanover (West Germany). Institut fuer Meteorologie und Klimatologie.
R. Kaviani.
Z Acker Pflanzebau. 139(4), p 249-258, 1974.

Descriptors: *Evaporation, Groundwater, *Lysimeter, *Analytical techniques, *Humidity, *Methodology, Soil moisture.
Identifiers: Haude method, Albrecht method, Thornthwaite method.

A comparison of lysimeter measured values of potential evaporation with the values calculated by 3 different methods (Albrecht, Haude, Thornthwaite) shows considerable differences. Whereas the Albrecht-method gives very low values and the Thornthwaite-method very high ones, the Haude-method supplies satisfactory results which come close to the measured values of potential evaporation. Under these experimental conditions, there was a close correlation between the measured potential evaporation and the actual evaporation, when the soil-humidity remained above the wilting point.--Copyright 1975, Biological Abstracts, Inc.
W76-12757

QUANTITATIVE RELATIONSHIP BETWEEN REFLECTANCE AND TRANSPIRATION OF PHREATOPHYTES--GILA RIVER TEST SITE,
Geological Survey, Tucson, Ariz.
R. C. Culler, J. E. Jones, and R. M. Turner.
In: 4th Annual Earth Resources Program Review, Volume III, U.S. Geological Survey Programs, Houston, Texas, January 17-21, 1972: NASA, Manned Spacecraft Center MSC-05937, p 83-1 - 83-9, 1972. 3 fig, 6 ref.

Descriptors: *Evapotranspiration, Measurement, *Remote sensing, *Aerial photography, *Vegetation effects, *Phreatophytes, Photogrammetry, Surveys, *Arizona.
Identifiers: *Gila River test site(Ariz).

The feasibility of using aerial photographs to estimate evapotranspiration (ET) from large parcels of the landscape has been studied by the U.S. Geological Survey at the Gila River Phreatophyte Project in Arizona for several years. Repetitive color-IR (infrared) aerial photography has been used since 1967 as a means of estimating the volume of transpiring vegetation covering the project site. As plants are one of the main avenues through which water vapor is lost from a hydrologic system, a measure of plant volume should provide a means for estimating the transpiration component of ET. The analysis described indicates that remote sensing can be used for this purpose. Color-IR photographs, using various film types, cameras, and filters, were obtained on 33 dates from 1967 through 1970. The photography and film processing was done by NASA and by the U.S. Geological Survey. All photographs were color transparencies. Most were taken from an elevation of 8,500 feet, and all were in 9-inch format. (Woodard-USGS)
W76-12802

FINITE DIFFERENCE AND FINITE ELEMENT SIMULATION OF FIELD WATER UPTAKE BY PLANTS,
Institute for Land and Water Management Research, Wageningen (Netherlands).
For primary bibliographic entry see Field 2G.
W76-12830

THE SIMPLIFIED INTEGRAL MATHEMATICAL MODEL ON A SMALL LOW-LAND CATCHMENT,
Technical Univ. of Warsaw (Poland). Inst. of Environmental Engineering.
For primary bibliographic entry see Field 2A.
W76-12831

SPRINKLER EVAPORATION LOSSES IN THE SOUTHERN PLAINS,
Southwestern Great Plains Research Center, Bushland, Tex.
For primary bibliographic entry see Field 3F.
W76-13004

THERMAL LOADING OF HYCO LAKE, NORTH CAROLINA-- THE EFFECT OF HEATED WATER ON TEMPERATURE AND EVAPORATION, 1966-74,
Geological Survey, Raleigh, N. C.
For primary bibliographic entry see Field 5C.
W76-13078

2E. Streamflow and Runoff

A BRIEF HYDROLOGIC APPRAISAL OF THE JULY 3-4, 1975, FLASH FLOOD IN LAS VEGAS VALLEY, NEVADA.
Geological Survey, Carson City, Nev.
For primary bibliographic entry see Field 4A.
W76-12806

A MATHEMATICAL MODEL FOR FLOOD-WAVE FORECASTING BY MEANS OF WARNING BASINS,
Institutul de Meteorologie si Hidrologie, Bucharest (Rumania).
For primary bibliographic entry see Field 4A.
W76-12829

A NOTE ON THE STEP ERROR OF SOME FINITE-DIFFERENCE SCHEMES USED TO SOLVE KINEMATIC WAVE EQUATIONS,
New Mexico Inst. of Mining and Technology, Socorro.
V. P. Singh.
Journal of Hydrology, Vol. 30, No. 3, p 247-255, July 1976. 1 fig, 17 ref.

Descriptors: *Numerical analysis, *Hydrology, *Analytical techniques, *Methodology, Compu-

ters, Mathematics, Approximation method, Equations, Stability, Mathematical studies.
Identifiers: *Kinematic wave equation, *Finite-difference schemes, Convergence, Discretization error, Step error.

The magnitude of the discretization error in numerical solutions of kinematic wave equations depends on the steplength of distance, x, and time, t, in x, t space. A round-off error is introduced each time a calculation is done. A set of finite difference equations is stable when the cumulative effect of all round-off errors is negligible. The total error is the sum of the discretization and stability errors. The discretization error is dominant in a stable and convergent scheme. An analytical treatment was developed for the discretization or step error of some finite difference schemes that are frequently used to solve the kinematic wave equations. It was shown that for convergent and stable schemes the production of step error of one scheme may not be the same as that of another. The distinction must be considered in choosing between the schemes. It was found that knowledge of step error is a useful parameter to estimate a priori the step length to be used in a given scheme. (Singh-ISWS)
W76-12834

EFFECTS OF OVERBANK FLOW IN FLOOD COMPUTATIONS,
Asian Inst. of Tech., Bangkok (Thailand). Div. of Water Resources Engineering.
T. Tingsanchali, and N. L. Ackermann.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 102, No. HY7, Proceedings Paper 12266, p 1013-1025, July 1976. 8 fig, 10 ref, 2 append.

Descriptors: *Flood plains, *Floods, *Unsteady flow, *Overland flow, River flow, Continuity equation, Momentum equation, Hydraulics, Channel morphology, Mathematical models, Rivers, Equations, Berms.
Identifiers: *Philippines, *Bicol River(Philippines).

The derivation and application of unsteady free surface flow equations which describe floods in rivers where dynamic effects are considered in both the main channel as well as berm or overbank sections of the flood plain were presented. Literature to date considers overbank portions of a river significant only for purposes of storage. Such an assumption is not always justified. The equations were used to describe flood conditions that occurred in 1970 in the Bicol River Basin in South Luzon, Philippines. The dynamic effects of the flow in the berms were determined by comparing the computed river stages and discharges considering conditions with and without the dynamic effects of the berm flow. (Lardner - ISWS)
W76-12976

A MATHEMATICAL MODEL OF THE 'RESERVOIR' TYPE DESIGNED FOR FLOOD-WAVE MODELLING AND FORECASTING,
Institutul de Meteorologie si Hidrologie, Bucharest (Rumania).
For primary bibliographic entry see Field 2A.
W76-12979

AN ADAPTIVE IDENTIFICATION AND PREDICTION ALGORITHM FOR THE REAL-TIME FORECASTING OF HYDROLOGICAL TIME SERIES,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
For primary bibliographic entry see Field 2A.
W76-12980

COMPILING BATHYMETRY FOR FLOW SIMULATION MODELS,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W76-13064

INDEX TO NATIONAL TOPOGRAPHIC MAPS: 1:250,000-SCALE SERIES.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W76-13077

ESTIMATING PEAK DISCHARGES FROM SMALL DRAINAGES IN NEVADA ACCORDING TO BASIN AREAS WITHIN ELEVATION ZONES,
Geological Survey, Carson City, Nev.
For primary bibliographic entry see Field 4A.
W76-13080

A SIMPLIFIED SLOPE-AREA METHOD FOR ESTIMATING FLOOD DISCHARGES IN NATURAL CHANNELS,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 4A.
W76-13083

TECHNICAL MANUAL FOR ESTIMATING LOW-FLOW FREQUENCY CHARACTERISTICS OF STREAMS IN THE SUSQUEHANNA RIVER BASIN,
Geological Survey, Harrisburg, Pa.
For primary bibliographic entry see Field 4A.
W76-13086

2F. Groundwater

FLUCTUATIONS OF GROUND-WATER LEVELS IN LEE COUNTY, FLORIDA, IN 1974,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 4B.
W76-12801

HYDROLOGY OF LIMESTONE TERRANES, PROGRESS OF KNOWLEDGE ABOUT HYDROLOGY OF CARBONATE TERRANES,
Geological Survey of Alabama, University.
P. E. LaMoreaux, H. E. LeGrand, V. T. Stringfield, J. S. Tolson, and W. M. Warren.
Bulletin 94, Part E, July 1975. 168 p, 1 tab, 103 ref.

Descriptors: *Carbonate rocks, *Terrain analysis, *Karst hydrology, *Karst, Paleohydrology, Bibliographies, Limestones, Rocks, Sinks, Caves, Groundwater, Geology, Land use, Geomorphology, Reviews, Hydrogeology.
Identifiers: Subsurface hydrology, Limestone hydrology studies, Limestone terranes, Chalk.

Carbonate rocks, primarily limestones and dolostones, comprise roughly 15% of all sedimentary rocks that underlie 75% of the earth's surface. These rocks are of great economic importance for their own value and contain, in places, large amounts of groundwater, an important quantity of the world's supply of petroleum and natural gas, and valuable reserves of the world's metals. Because of their unique and complex characteristics, a great deal of research has been dedicated to the study of carbonate rocks. In the past decade, there has been an increased interest in carbonate rocks and, particularly, their hydrologic characteristics. Literature on carbonate rocks, describing their influence on man, appears in publications of all types, ranging from special or feature stories in newspapers and magazines to technical journals, textbooks, and treatises. The sources of the literature are worldwide, illustrating the wide distribution of carbonate rocks and their importance to man. This literature survey covered the progress of knowledge about hydrology of carbonate terranes. A 795-entry, annotated bibliography of carbonate rocks was included in this volume. (Sims-ISWS)
W76-12813

PUBLIC GROUNDWATER SUPPLIES IN LAKE COUNTY,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 4B
W76-12824

ONSET OF THERMOHALINE CONVECTION IN A CAVERNOUS AQUIFER,
Florida Univ., Gainesville. Dept. of Civil Engineering.
H. Rubin.
Water Resources Research, Vol. 12, No. 2, p 141-147, April 1976. 3 fig, 21 ref.

Descriptors: *Groundwater, *Geothermal studies, *Convection, *Florida, *Aquifers, Equations, Mathematical studies, Mathematical models, Heat flow, Heat transfer, Thermal water, Flow, Hydrothermal studies, Caves, Stability, Mathematics.
Identifiers: *Thermohaline convection, *Florida aquifer, *Cavernous aquifer, *Solute dispersion, *Perturbation analysis, Instability criteria, Thermal gradient.

In some groundwater aquifers, geothermal activity may lead to thermal convection. In such cases very often saline hot water is transferred from the deep layers of the aquifer into the upper layers. There is an hypothesis that such a mechanism does exist in the deep regions of the Floridan aquifer. However, the deep zone of the Floridan aquifer is extremely cavernous. Therefore even very slow motions may lead to an intensive dispersion of soluted materials and heat as well as to turbulent effects demonstrated by the invalidity of the laminar Darcy law. In this study, all these effects and their connection with the onset of thermohaline convection were investigated. It was found possible to define in the field a plane where applied perturbations are the most disturbing to the flow field. In this plane, convection motion is initiated. This plane formed an angle theta sub c with the unperturbed velocity vector. Angle theta sub c varied according to flow conditions between 0 and 90 degrees. Approaches were developed for the determination of instability criteria for different regions of the Reynolds number. (Pricket-ISWS)
W76-12835

ANALYSIS OF AQUIFER-AQUITARD FLOW,
Birmingham Univ. (England). Dept. of Civil Engineering.
T. D. Streltsova.
Water Resources Research, Vol. 12, No. 3, p 415-422, June 1976. 8 fig, 15 ref.

Descriptors: *Equations, *Aquifers, *Aquitards, *Groundwater movement, *Drawdown, Water wells, Water table, Leakage, Flow system, Hydraulic properties, Graphical analysis, Mathematical studies, Permeability, Storage coefficient, Specific yield, Flow.
Identifiers: *Partial penetration, *Type curves.

The general drawdown equation and its particular cases were considered for a partially penetrating well discharging at a constant rate from an aquifer which is overlain by an aquitard containing the water table. An identity was established between the exact solutions, developed in terms of the rho = mu(r)/h parameter, and those based on the finite difference approximation, developed in terms of the r/B parameter. The relations in the rho and the r/B parameter were given for a well of complete penetration. The quasi-steady drawdown equation was developed for a well of partial penetration in an aquifer-aquitard flow system. The solution was graphically presented, and its use in the distance-drawdown curve-matching procedure was described. Determination of the aquifer-aquitard formation constants was discussed. (Visocky-ISWS)
W76-12836

LIBRARY U. OF I. URBANA-CHAMPAIGN

E CONDUCT OF CERTAIN LONG-LIVED OTOPES IN ROCKS IN THE CASE OF THEIR NTAMINATION WITH NONTECHNICAL FLUENTS OF THE ATOMIC ELECTRIC WER STATIONS (AES), (IN RUSSIAN),
r primary bibliographic entry see Field 5B.
6-12908

OUND WATER MOVEMENT,
tional Water Well Association, Worthington, io.
r primary bibliographic entry see Field 4B.
6-13031

NAMICS OF SALTS SIO2, R2O3, MNO AND TER-SOLUBLE ORGANIC MATTER IN UN-RGROUND WATER, (IN RUSSIAN),
ademiya Nauk SSSR, Novosibirsk. Inst. of Soil ences and Agrochemistry.
primary bibliographic entry see Field 5B.
6-13043

AILABILITY OF GROUND WATER IN THE DDLE CONNECTICUT RIVER BASIN, ST-CENTRAL NEW HAMPSHIRE,
logical Survey, Concord, N. H.
primary bibliographic entry see Field 7C.
5-13062

O-DIMENSIONAL STEADY-STATE DISPER-N IN A SATURATED POROUS MEDIUM,
logical Survey, Menlo Park, Calif.
Ogata.
rnal of Research of the U S Geological Survey, 4, No 3, p 277-284, May-June 1976. 6 fig, 10

criptors: *Groundwater movement, *Porous ia, *Dispersion, *Mathematical models, Mass sfer, Saturated flow.
tifiers: *Groundwater tracer.

previously developed analytical solution for -dimensional dispersion of groundwater is puted for various conditions. These results e then compared with solution of previously eloped approximate models of transverse ersion which were used to analyze experimen- derived concentration distribution. Com-son established that, whenever steady state reached, the values of dispersion coefficient puted using the approximate expression ed with values derived from exact expression in addition allowed a quick computation of the meter. (Woodard-USGS)
-13071

OLOGY AND GROUND-WATER OURCES OF UNION COUNTY, NEW JER-
logical Survey, Trenton, N. J.
primary bibliographic entry see Field 4B.
-13072

OHYDROLOGY OF THE OKLAHOMA PAN-DLE, BEAVER, CIMARRON, AND TEXAS NTIES,
ogical Survey, Oklahoma City, Okla.
primary bibliographic entry see Field 4B.
-13081

TAL MODELS OF A GLACIAL OUTWASH IFER IN THE PEARL-SALLIE LAKES A, WEST-CENTRAL MINNESOTA,
ogical Survey, St. Paul, Minn.
Larson, M. S. McBride, and R. J. Wolf.
lable from the National Technical Informa-Service, Springfield, VA 22161 as PB-255 070, in paper copy, $3.00 in microfiche. Water-urces Investigations 40-75, November 1975. 15 fig, 1 tab, 18 ref.

Descriptors: *Surface-groundwater relationships, *Aquifer characteristics, *Lakes, *Groundwater movement, *Model studies, Hydrogeology, Inflow, Discharge(Water), Mathematical models, Water level fluctuations, Seepage, Leakage, Computer models, Cross-sections, *Minnesota.
Identifiers: West-central Minnesota, *Pearl-Sallie Lakes area(Minn).

The need for study of lake-ground-water interchange has been accentuated by eutrophication of lakes in the Pearl-Sallie Lakes area of west-central Minnesota. The local ground-water flow system is dominated by a sand and gravel outwash aquifer that is sandwiched between two layers of till in the western part of the area and exposed at the land surface in the eastern part. Water discharges from the aquifer into lakes in the outwash area but the aquifer is recharged from lakes in the till-covered area. Irregular aquifer geometry has resulted in a complex ground-water flow system. Simulation of the system by areal and vertical-section models has shown that the lakes significantly control ground-water flow near their shores. Evaluation of the models has indicated that they may be used to guide field-data collection, interpretation of data, and quantification of the ground-water flow system. With modification, the models could be used to predict aquifer response to transient stresses. Also, they could be incorporated into more complex models, to determine the movement of solutes in the ground-water system. (Woodard-USGS)
W76-13082

FACTORS AFFECTING DECLINING WATER LEVELS IN A SEWERED AREA OF NASSAU COUNTY, NEW YORK,
Geological Survey, Albany, N.Y.
For primary bibliographic entry see Field 5B.
W76-13084

FINITE-DIFFERENCE MODEL FOR AQUIFER SIMULATION IN TWO DIMENSIONS WITH RESULTS OF NUMERICAL EXPERIMENTS,
Geological Survey, Reston, Va.
P. C. Trescott, G. F. Pinder, and S. P. Larsen.
Techniques of Water-Resources Investigations, Book 7, Chapter C1, 1976. 116 p, 33 fig, 3 tab, 28 ref.

Descriptors: *Computer models, *Groundwater movement, *Saturated flow, *Numerical analysis, Methodology, Forecasting, Groundwater, Water table, Confined water, Aquifers, Computer programs.
Identifiers: *FORTRAN IV, Two-dimensional simulation, Finite-difference methods, Strongly implicit procedure.

The model will simulate ground-water flow in an artesian aquifer, a water-table aquifer, or a combined artesian and water-table aquifer. The aquifer may be heterogeneous and anisotropic and have irregular boundaries. The source term in the flow equation may include well discharge, constant recharge, leakage from confining beds in which the effects of storage are considered, and evapotranspiration as a linear function of depth to water. The theoretical development includes presentation of the appropriate flow equations and derivation of the finite-difference approximations (written for a variable grid). The documentation emphasizes the numerical techniques that can be used for solving the simultaneous equations and describes the results of numerical experiments using these techniques. The documentation includes a flow chart, program listing, an example simulation, and sections on designing an aquifer model and requirements for data input. It illustrates how model results can be presented on the line printer and pen plotters with a program that utilizes the graphical display software available from the Geological Survey Computer Center Division. In addition the model includes options for reading input data from a disk and writing intermediate results on a disk. (Woodard-USGS)
W76-13085

VERTICAL TEMPERATURE AND CHEMICAL GRADIENTS IN GROUNDWATER IN THE TUCSON BASIN, ARIZONA,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 4B.
W76-13129

2G. Water In Soils

INTER-RELATION OF KEY-FACTORS FOR INFILTRATION OF LIQUID DOMESTIC WASTE INTO SOIL,
Connecticut Univ., Storrs.
For primary bibliographic entry see Field 5D.
W76-12679

STUDIES ON THE INTERACTIONS BETWEEN SOIL WATER AND THINLY DISPERSED SOLID MATTER USING THE MOIST HEAT METHOD, (IN ROMANIAN),
Institutul de Studii si Cercetari Pedologie, Bucharest (Rumania).
S. Balan.
An Inst Stud Cercet Pedol. 40, p 13-29, 1972.

Descriptors: *Soil water, *Soils, Soil profiles, Dispersion, Soil texture, Cation exchange, Heat, *Soil moisture.
Identifiers: *Moist heat method.

About 300 determinations were made with the moist heat method in different types of soils including a wide range of variations from acid brown sandy soils up to intensely clayey vertic wet meadow soils. Determinations were made in all horizons and subhorizons, at the same levels at which the other determinations and physical, chemical and mineralogical analysis were performed. The values of moist heat were influenced by different factors, the more important ones being texture, humus, mineral composition, cation exchange capacity and soil structure. The moist heat determined on the whole soil profile was used to estimate the effective soil particle surface area. The results are in agreement with literature data obtained for similar soils.--Copyright 1975, Biological Abstracts, Inc.
W76-12706

COMPARATIVE STUDIES OF PLANT GROWTH AND DISTRIBUTION IN RELATION TO WATERLOGGING: VII. THE INFLUENCE OF WATER-TABLE FLUCTUATIONS ON IRON AND MANGANESE AVAILABILITY IN DUNE SLACK SOILS,
Trent Univ., Peterborough (Ontario). Dept. of Biology.
For primary bibliographic entry see Field 2I.
W76-12708

EDAPHIC FACTORS IN SPECIES AND ECOTYPE DIFFERENTIATION OF SAGITTARIA,
Iowa State Univ., Ames. Dept. of Botany and Plant Pathology.
J. W. Wooten.
J Ecol. 61(1), p 151-156, 1973.

Descriptors: *Aquatic plants, *Soils, Hydrogen ion concentration, Calcium, Phosphorus, Potassium.
Identifiers: *Ecotype differentiation, Sagittaria-Graminea-Var-Weatherbiana, *Sagittaria, Sagittaria-Cristata, Sagittaria-Graminea, Sagittaria-Graminea-Var-Chapmani, Sagittaria-Graminea-Var-Graminea, Sagittaria-Platyphylla.

Soil from populations of 4 ecotypes of 2 varieties within the S. graminea complex (S. graminea var. weatherbiana, S. graminea var chapmani), a 3rd

variety of this complex (S. graminea var. graminea), and from populations of S. cristata and S. platyphylla were analyzed. Values for pH, CaO, MgO, P2O5 and K2O were established, and tests for significance of the data made. Significant soil nutrient levels were established that were characteristic for and served to delimit each taxon. Two of the 4 ecotypes were found to be specific to certain soils. Edaphic adaptation appears to be of importance in this group of plants and may be of significance in other hydrophytes.--Copyright 1974, Biological Abstracts, Inc.
W76-12739

STUDIES ON THE POTENTIAL EVAPORATION OF LAWNS UNDER DIFFERENT CONDITIONS OF UNDERGROUND WATER: A COMPARISON OF CALCULATED VALUES WITH THE VALUES OF A LYSIMETER, (IN GERMAN),
Technische Universitaet, Hanover (West Germany). Institut fuer Meteorologie und Klimatologie.
For primary bibliographic entry see Field 2D.
W76-12757

MEASUREMENT AND EVALUATION METHODS FOR THE DETERMINATION OF THE UNSATURATED HYDRAULIC CONDUCTIVITY OF SOILS IN SITU, (IN GERMAN).
U. Krahmer.
Z Pflanzenernaehr Bodenkd. 137(2), p 95-107, 1974.

Descriptors: Hydraulic conductivity, Measurement, Methodology, Soils, Evaporation, Soil profiles, Soil moisture, Tension, Tensiometers.

The unsaturated hydraulic conductivity was determined as a function of the moisture tension in 32 soil profiles in situ. Values were typical of Nordrhein-Westfalen(Germany) and included ground- and static-water profiles. The surface of the almost saturated soil was subjected to evaporation and changes in moisture and potential in the soil were measured. Measurements were made with Neutron moisture gauges and tensiometers. A given moisture tension increase in any soil compartment was attributed to a change in water content. The combined gauge and tensiometer measurements were analyzed using the Darcy and continuity equations for the quasistable state with the help of electronic data processing equipment.--Copyright 1975, Biological Abstracts, Inc.
W76-12799

INVESTIGATIONS CONCERNING MAPPING AND CLASSIFYING OF MARSH SOILS, (IN GERMAN),
Kiel Univ. (West Germany). Geologisch-Palaeontologisches Institut und Museum.
W. Prange, G. Bruemmer, and E. Weber.
Meyniana. 25, p 59-86, 1974.

Descriptors: *Soil classification, *Mapping, Europe, Ion exchange, Clays, Soil compaction, Marsh management, Soil compaction.
Identifiers: West Germany, *Marsh soils, *Calcium magnesium ration.

Results from a large scale soil mapping on the North Frisian (West Germany) mainland indicate that field characteristics, particularly the grain-size, bedding and degree of compaction, are closely correlated with each other and with other filed and laboratory data. Exchangeable ions and the Ca/Mg-ratio, however, indicate no connections with the soil units and with most of the other field characteristics but are determined by processes of the development of soil and landscape, such as desalting and decalcification, silicate weathering, fresh-and salt-water inundations, salty precipitations, salty groundwater and fertilization. Therefore the Ca/Mg-ratio is not suitable for differentiating between more clayey compacted Knick-marsh soils and less clayey permeable Kleimarsh soils.--Copyright 1975, Biological Abstracts, Inc.
W76-12814

FINITE DIFFERENCE AND FINITE ELEMENT SIMULATION OF FIELD WATER UPTAKE BY PLANTS,
Institute for Land and Water Management Research, Wageningen (Netherlands).
R. A. Feddes, P. Kowalik, S. P. Neuman, and E. Bresler.
Hydrological Sciences Bulletin, Vol. 21, No. 1, p 81-98, March 1976. 15 fig, 10 ref.

Descriptors: *Finite element analysis, Flow, *Soil management, *Soil investigations, *Plant growth, Hydraulic conductivity, Root zone, Soil water, Numerical analysis, Water balance, Evapotranspiration, Unsteady flow, *Soil-water-plant relationships, Moisture content.
Identifiers: *Finite element simulation, Soil-plant system, Root-soil interface.

The problem of non-steady flow of water in a soil-plant system was described by adding a sink term to the continuity equation for soil water flow. The sink term was defined in two different ways. First, it was considered to be dependent on the hydraulic conductivity of the soil, on the difference in pressure head between the soil and the root-soil interface, and some root effectiveness function. Second, the sink was taken to be a prescribed function of the soil water content. The partial differential equation applying to the first problem was solved by both the finite difference and a finite element technique. The equation applying to the second problem was solved by a finite difference approach. The paper verified the numerical models against field measurements. It compared the results obtained by the three numerical methods and showed how the finite method could be applied to complex but realistic two-dimensional flow situations. Two examples were given. The first example concerned one-dimensional flow. It compared numerical results with those obtained experimentally in the field from water balance studies on red cabbage grown on a clay soil in the presence of the water table. The second example described two-dimensional flow in a complex field situation in the Netherlands where flow took place under cropped field conditions through five anisotropic layers. Water was supplied to the system by infiltration from two unlined ditches and was withdrawn from the system by evapotranspiration and by leakage to an underlying pumped aquifer. (Roberts-ISWS)
W76-12830

A NEW MODEL FOR PREDICTING THE HYDRAULIC CONDUCTIVITY OF UNSATURATED POROUS MEDIA,
Technion - Israel Inst. of Tech., Haifa. Dept. of Civil Engineering.
Y. Mualem.
Water Resources Research, Vol. 12, No. 3, p 513-522, June 1976. 4 fig, 3 tab, 34 ref, 3 append. U.S.-ISBF 422.

Descriptors: *Unsaturated flow, *Hydraulic conductivity, *Mathematical models, *Porous media, Moisture content, Pore pressure, Saturation, Theoretical analysis, Soil properties, Homogeneity, Porosity, Capillary conductivity, Soil types, Model studies, Equations, Mathematical studies.
Identifiers: *Tortuosity.

A simple analytic model was proposed which predicts the unsaturated hydraulic conductivity curves by using the moisture content-capillary head curve and the measured value of the hydraulic conductivity at saturation. It was similar to the Childs and Collis-George (1950) model but used a modified assumption concerning the hydraulic conductivity of the pore sequence in order to take into account the effect of the larger pore section. A computational method was derived for th determination of the residual water content ar for the extrapolation of the water content-capilla head curve as measured in a limited range. Th proposed model was compared with the existin practical models of Averjanov (1950) Wyllie ar Gardner (1958), and Millington and Quirk (196 on the basis of the measured data of 45 soils. seemed that the new model is in better agreeme with observations. (Visocky-ISWS)
W76-12837

WETTING FRONT PRESSURE HEAD IN TH INFILTRATION MODEL OF GREEN AN AMPT,
Arizona Univ., Tucson. Dept. of Hydrology a Water Resources.
S. P. Neuman.
Water Resources Research, Vol. 12, No. 3, p 56 566, June 1976. 22 ref.

Descriptors: *Soil water movement, *Model st dies, Mathematical studies, *Infiltration, *Po pressure, *Pressure head, *Air circulatio Wetting, Water pressure, Seepage, Soil prope ties, Time, Gravitational water sorption, Unsat rated flow, Equations.
Identifiers: *Wetting front, *Infiltration mod *Green-Ampt model, *Sorptivity.

A theoretical expression relating the wetting fro pressure head in the infiltration model of Gre and Ampt to soil characteristics was derived. Th expression was identical to that previously su gested by Bouwer on the basis of an analogy w horizontal flow. It differed from a more comple expression recently proposed by Morel-Seyto and Khanji in that the effect of air mobility w neglected, the need for determining the functio relationship between the relative permeability air and water saturation thus being avoide (Prickett-ISWS)
W76-12839

TRANSIENT DISPERSION IN UNIFOR POROUS MEDIA FLOW,
Sargent and Lundy, Chicago, Ill.
For primary bibliographic entry see Field 5B.
W76-12842

INVESTIGATIONS ON THE WATER REGIM OF THE MAIN SOIL TYPES OF THE CR RIVER PLAIN, (IN ROMANIAN),
Institutul de Studii si Cercetari Pedolog Bucharest (Rumania).
I. Vlas, and E. Stepanescu.
An Inst Stud Cercet Pedol. 40, p p 89-9 1972(1974).

Descriptors: *Flood plains, *Soil typ *Chernozems, Wheat, Corn(Field), Physical p perties, Chemical properties, Hydraulic prop ties.
Identifiers: *Cris River plain(Romania).

Studies were carried out for 4 yr on the main s types (medium leached chernozem free of phrea supply, medium leached chernozem-like mead soil, wet meadow soil, brown flood plain and al vial soils) under wheat and corn. The physic chemical and hydric properties (wilting coe cient, field moisture capacity and available wa capacity) are described, and the water regime determined in terms of soil types and pla requirements. In these soils the type of wa regime is differentiated in terms of their main p perties. In medium leached chernozems with water supply, the water regime is periodica deep-penetrating; in medium leached chernozem wet meadow and alluvial soils, it is at tim deeply phreatic and capillary.--Copyright 19 Biological Abstracts, Inc.
W76-12856

UNIVERSITY OF ILLINOIS-URBANA-CHAMPAIGN

ECT OF THE SOIL MOISTURE REGIME THE PASSAGE OF STRONTIUM-90, CESI-137 AND CERIUM-144 FROM SOIL INTO UTION, (IN RUSSIAN),
Science Center, Sverdlovsk (USSR). Inst. of t and Animal Ecology.
primary bibliographic entry see Field 5B.
-12868

AVIOR OF CESIUM-137 IN SOILS AND -PLANT SYSTEMS, (IN POLISH),
h Academy of Sciences, Warsaw. Agricul-Isotopes Lab.
primary bibliographic entry see Field 5B.
-12909

MICAL AND PLANT EXTRACTABILITY METALS AND PLANT GROWTH ON SOILS NDED WITH SLUDGE,
rtment of Agriculture, Ottawa (Ontario). Soil arch Inst.
primary bibliographic entry see Field 5B.
-12929

ROXIMATIONS FOR VERTICAL INFIL-TION RATE PATTERNS,
cultural Research Service, Tucson, Ariz. nwest Watershed Research Center.
Smith.
sactions of the American Society of Agricul-Engineers, Vol. 19, No. 3, p 505-509, May-1976. 3 fig, 19 ref.

riptors: *Infiltration, *Soil physics, tration rates, *Unsaturated flow, *Soil water ment, Soils, Porous media, Equations, Soil erties, Mathematical models, Unsteady flow, puter models, Model studies.

need for description of the time-varying rate iltration into soils led to the development of ical formulas before the physics of fluid flow rous media provided theoretical tools for sis of this aspect of unsaturated soil water ment. Selected contributions toward a usable iption of the surface-soil infiltration rate for boundary and initial conditions were wed. The approximations ranged from simple las to complex models developed from com-analysis of Richards' equation. The trade-n number of parameters and accuracy were ssed for several infiltration models. (Adams -)
12977

ES OF NITROGEN IN SURFACE RUNOFF E BLACKLAND PRAIRIE OF TEXAS,
Agricultural Experiment Station, College n.
imary bibliographic entry see Field 5G.
2982

VOLUME DISTRIBUTION AND CURVE ATER CONTENT VERSUS SUCTION OF US BODY: 1. TWO BOUNDARY DRYING ES,
Univ. (Japan). Lab. of Soil Hydrology.
kano.
cience, Vol. 122, No. 1, p 5-14, July 1976. 7 ab, 21 ref.

ptors: *Porosity, *Moisture content, ematical models, *Theoretical analysis, us media, Pore water, Saturation, Probabili-ying, Curves, Graphical analysis, Tubes, studies, Volume, Pores.
iers: Pore shape, Pore radius, Pore volume.

e model was proposed. It was a cylindrical whose cross section expanded (0-type) or shed (X-type) from the inlet towards the . Pore volume distribution was derived by he probability concept. Its density function was an exponential function. The saturation boundary drying curve and the ultimate curve of water content of porous body versus suction were also derived. These curves were represented by three physical parameters, one characterizing pore volume distribution, one showing the minimum pore radius, and one representing pore shape. These theoretical curves were compared to experimental data and were found to be in good agreement for sand and sandy soil. (Visocky - ISWS)
W76-12984

MODEL FOR PREDICTING SIMULTANEOUS MOVEMENT OF NITRATE AND WATER THROUGH A LOAMY SAND,
Wisconsin Univ., Madison. Dept. of Soil Science.
For primary bibliographic entry see Field 5B.
W76-12985

SOLUTE DISPERSION IN SATURATED SOIL COLUMNS,
Connecticut Agricultural Experiment Station, Storrs. Dept. of Soil and Water.
For primary bibliographic entry see Field 5B.
W76-12986

SEDIMENT FROM DRAINAGE SYSTEMS FOR A HEAVY SOIL,
Ohio State Univ., Columbus. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 3F.
W76-13001

SPRINKLER IRRIGATION PERCOLATION LOSSES,
Agricultural Research Service, Morris, Minn.
For primary bibliographic entry see Field 3F.
W76-13005

PHYSICAL-CHEMICAL COMPOSITION OF ERODED SOIL,
Purdue Univ., Lafayette, Ind. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2J.
W76-13010

LEAF WATER POTENTIAL AND MOISTURE BALANCE--FIELD DATA,
Agricultural Research Service, Auburn, Ala.; and Alabama Agricultural Experiment Station, Auburn.
For primary bibliographic entry see Field 2I.
W76-13011

DEFLECTION-STIFFNESS CHARACTERISTICS OF CORRUGATED PLASTIC TUBING,
Ohio Agricultural Research and Development Center. Columbus.
For primary bibliographic entry see Field 4A.
W76-13018

PREDICTED VERSUS MEASURED DRAINABLE POROSITIES,
North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering.
For primary bibliographic entry see Field 4A.
W76-13019

AN EXPERIMENT WITH A LINEARLY INCREASING SPACING OF SUBSURFACE DRAINS,
Macdonald Coll., Ste. Anne de Bellevue (Quebec). Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 4A.
W76-13020

EFFECT OF OPENINGS ON INFLOW INTO CORRUGATED DRAINS,
Ohio Agricultural Research and Development Center, Columbus.
For primary bibliographic entry see Field 4A.
W76-13021

TILLAGE, MATRIC POTENTIAL, OXYGEN AND MILLET YIELD RELATIONSHIPS IN A LAYERED SOIL,
Agricultural Research Service, Florence, S.C. Coastal Plains Soil and Water Conservation Research Center.
For primary bibliographic entry see Field 3F.
W76-13022

SOIL MOISTURE REGIME WITH SUBIRRIGATION,
Universidad del Valle, Cali (Colombia).
R. Vallderuten, J. T. Ligon, and J. R. Lambert.
Presented at the 1975 Winter Meeting of the American Society of Agricultural Engineers, December 15-18, 1975. Chicago, Illinois, 29 p, 14 fig, 14 ref. ASAE Paper 75-2576.

Descriptors: *Soil moisture, *Irrigation, *Subsurface irrigation, *Model studies, Simulation analysis, Soil-water-plant relationships, Climatic data.

A simulation model was developed to predict the soil moisture regime with subirrigation. Conclusions drawn from the performance of the model are: (1) the simulation model incorporating some plant physical characteristics, soil and water properties, and climatic variables, gave reasonable results; (2) the physical process of water movement from the water table through the root system under subirrigation conditions is highly related to the evaporative losses at the surface; (3) water uptake by the root system is influenced by the root distribution and by the hydraulic characteristics of the soil; (4) a relatively small portion of the roots located in the vicinity of the water table is responsible for a large part of the water uptake; and (5) further studies involving a fluctuating water table in heterogenous soils are needed to obtain a simulation model more representative of the actual case. (Skogerboe-Colorado State)
W76-13023

PLANT WATER STRESS CRITERIA FOR IRRIGATION SCHEDULING,
North Dakota State Univ., Fargo. Dept. of Agricultural Engineering.
E. C. Stegman, L. H. Schiele, and A. Bauer.
Presented at the 1975 Winter Meeting of the American Society of Agricultural Engineers, December 15-18, 1975, Chicago, Illinois. 22 p, 7 fig, 6 tab, 18 ref. ASAE Paper 75-2555.

Descriptors: *Soil water, *Soil moisture, *Soil-water-plant relationships, *Scheduling, Crop response, Plant physiology, Plant tissues, Irrigation, Irrigation effects.

This study was conducted to determine the potential for relating plant water stress development to variables indicative of prevailing soil and atmospheric environments. Given such relationships irrigation scheduling services should be better able to use plant stress oriented criteria for determining when to irrigate. Stress development was evaluated by leaf xylem pressure and stomatal diffusion resistance measurements. Data sets were obtained for 4 to 5 crops at two Irrigation Branch Stations in North Dakota. The two sites provided soil types with differing hydraulic properties and available water holding capacities. Leaf xylem pressure data for each crop-soil combination were correlated by regression procedures with ambient air temperatures and root zone soil moisture content. Subsequent application of these xylem pressure levels as critical limits to each regression model permitted estimation of allowable root zone soil

moisture depletion relative to expected ambient air temperatures. This procedure offers a method for interpreting water balance estimates of soil moisture deficit and advance forecasts of daily maximum air temperatures for need of irrigation. (Skogerboe-Colorado State)
W76-13024

WELL CUTTINGS ANALYSIS IN GROUNDWATER RESOURCES EVALUATION,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
For primary bibliographic entry see Field 8G.
W76-13036

IDENTIFICATION AND NATURE OF DISPERSIVE SOILS,
Soil Conservation Service, Lincoln, Nebr.
For primary bibliographic entry see Field 8D.
W76-13170

PORE-WATER PRESSURE CHANGES DURING SOIL LIQUIFACTION,
California Univ., Berkeley. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8D.
W76-13171

RESULTS OF SOIL MOISTURE FLIGHTS DURING APRIL 1974,
National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center.
T. J. Schmugge, B. J. Blanchard, W. J. Burke, J. F. Paris, and J. R. Wang.
Report No. TN D-8199, May 1976. 55 p, 7 fig, 6 tab, 11 ref, 2 append.

Descriptors: *Remote sensing, *Soil moisture, *Microwaves, *Aircraft, *Arizona, Instrumentation, Measurement, Surveys, Equations, Radiation, Infrared radiation, Temperature, Soil temperature, Irrigation, On-site investigations.
Identifiers: Radiometers.

The results presented were derived from measurements made during the April 5 and 6, 1974 flights of the NASA P-3A aircraft over the Phoenix, Arizona agricultural test site. The purpose of the mission was to study the use of microwave techniques for the remote sensing of soil moisture. These results included infrared (10- to 12-micrometers) 2.8-cm and 21-cm brightness temperatures for approximately 90 bare fields. These brightness temperatures were compared with surface measurements of the soil moisture made at the time of the overflights. These data indicated that the combination of the sum and difference of the vertically and the horizontally polarized brightness temperatures yield information on both the soil moisture and surface roughness conditions. (Sims-ISWS)
W76-13178

2H. Lakes

BLUFF EROSION, RECESSION RATES, AND VOLUMETRIC LOSSES ON THE LAKE MICHIGAN SHORE IN ILLINOIS,
Illinois State Geological Survey, Urbana.
For primary bibliographic entry see Field 2J.
W76-12686

SURVEY FOR RADIOACTIVITY IN A SWAMP,
Du Pont de Nemours (E. I.) and Co., Aiken, S.C. Savannah River Plant.
For primary bibliographic entry see Field 5C.
W76-12689

ENVIRONMENTAL STATUS OF THE LAKE MICHIGAN REGION, VOLUME 3. CHEMISTRY OF LAKE MICHIGAN,
Wisconsin Univ., Madison. Water Chemistry Lab.
For primary bibliographic entry see Field 5C.
W76-12695

OSMOREGULATION IN TRICHOCORIXA VERTICALIS INTERIORES SAILER (HEMIPTERA, CORIXIDAE) - AN INHABITANT OF SASKATCHEWAN SALINE LAKES, CANADA,
Saskatchewan Univ., Saskatoon. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W76-12733

CESIUM 137 ACTIVITIES IN FISH RESIDING IN THERMAL DISCHARGES TO LAKE MICHIGAN,
Argonne National Lab., Ill. Radiological and Environmental Research Div.
For primary bibliographic entry see Field 5C.
W76-12738

FACTORS CONTROLLING RATES OF METHANE OXIDATION AND THE DISTRIBUTION OF THE METHANE OXIDIZERS IN A SMALL STRATIFIED LAKE,
Fisheries and Marine Service, Winnipeg (Manitoba). Freshwater Inst.
For primary bibliographic entry see Field 5B.
W76-12750

FEEDING CHARACTERISTICS AND PREDATION IMPACT OF CHAOBORUS (DIPTERA, CHAOBORIDAE) LARVAE IN A SMALL LAKE.
Toronto Univ. (Ontario). Inst. for Environmental Studies and Engineering.
A. Y. Fedorenko.
Limnology and Oceanography, Vol. 20, No. 2, March 1975. p 250-258, 11 ref, 7 fig.

Descriptors: *Ecology, *Predation, *Feeding rate, Temperature, Larvae, Size, Diel migration, *Diptera, Lakes, Behavior, Food habits.
Identifiers: *Chaoborus.

Data showed that, in general, feeding rates of C. americanus and C. trivittatus larvae increased with temperature, prey density and larval size and varied with prey type. Old fourth instar C. trivittatus larvae showed no change in feeding rates with temperature change. It was concluded that, since these larvae undergo extensive diel vertical migrations into the cold, food-poor hypolimnion, the maintenance of a relatively high feeding rate despite cold temperatures would be advantageous. Remaining larvae migrate less extensively and their feeding rates decline sharply as temperature falls. An absence of any pattern in day-to-day food intake by larvae held in the laboratory was noted. Estimated mean percentage of standing crop of prey eaten by Chaoborus was: 2% for copepod nauplii, 3% for Diaptomus tyrelli, 9% for Diaptomus kenai, and 4% for Diaphanosoma. Seasonal and spatial segration and size incompatability of predator and prey influenced Chaoborus predation. (Chilton-ORNL)
W76-12752

SPAWNING OF LAKE WHITEFISH, COREGONUS CLUPEAFORMIS, AND ROUND WHITEFISH, PROSOPIUM CYLINDRACEUM, IN AISHIHIK LAKE AND EAST AISHIHIK RIVER, YUKON TERRITORY,
Fisheries and Marine Service, Vancouver (British Columbia). Vancouver Lab.
J. E. Bryan, and D. A. Kato.
Journal of the Fisheries Research Board of Canada, Vol. 32, No. 2, 1975, p 283-288, 2 fig, 2 tab, 17 ref.

Descriptors: *Ecology, *Reproductio
*Spawning, Eggs, Freshwater fish, Lakes, River
*Canada
Identifiers: *Aishihik Lake(YT), East Aishih
River(YT), *Whitefish, Lake whitefish, Rou
whitefish.

The study resulted from the discovery of spawni
grounds of lake and round whitefish during an i
pact study of hydroelectric development. Resu
of the investigations showed that lake whitefi
spawned over silt and Potamogeton in water 2.
2.5 m deep where there was little current and th
the spawning period lasted from early Novemb
to mid-December. Spawning round whitefish a
peared to have been completed by Novemb
Although round whitefish spawned in a range
habitats(silt, Potamogeton, in fast and slow cu
rent and depths from 0.7 to 2.5m) eggs were m
often found on gravel in fast currents at depths
less than 1 m. (Chilton-ORNL)
W76-12754

**NEARSHORE CURRENTS AT POINT BEAC
WISCONSIN (1974-1975),**
Argonne National Lab., Ill.
For primary bibliographic entry see Field 7B.
W76-12758

**PERIPHYTON CROPS AND PRODUCTIVITY
A REACTOR THERMAL EFFLUENT,**
Du Pont de Nemours (E. I.) and Co., Aiken, S.
Savannah River Lab.
For primary bibliographic entry see Field 5C.
W76-12762

**MEASUREMENTS OF PHYSIC
PHENOMENA RELATED TO POWER PLA
WASTE HEAT DISCHARGES: LA
MICHIGAN, 1973 AND 1974,**
Argonne National Lab., Ill.
For primary bibliographic entry see Field 5B.
W76-12770

THERMAL PLUME MAPPING,
Argonne National Lab., Ill.
For primary bibliographic entry see Field 5B.
W76-12771

**MEASUREMENTS OF EDDY DIFFUSIVITI
IN NEARSHORE REGIONS OF LA
MICHIGAN,**
Argonne National Lab., Ill.
For primary bibliographic entry see Field 5B.
W76-12772

**A COMPARISON OF AERIAL INFRARED A
BOAT ORIENTED THERMAL PLUME ME
SUREMENT TECHNIQUES,**
Argonne National Lab., Ill.
For primary bibliographic entry see Field 5B.
W76-12773

**NEAR SHORE LAKE CURRENT INVESTIG
TIONS,**
Argonne National Lab., Ill.
For primary bibliographic entry see Field 5B.
W76-12774

**FIELD OBSERVATION OF THE DYNAMICS
HEATED DISCHARGE JETS,**
Argonne National Lab., Ill.
For primary bibliographic entry see Field 5B.
W76-12775

**SITE AND DESIGN TEMPERATURE RELAT
ECONOMICS OF NUCLEAR POWER PLAN
WITH EVAPORATIVE AND NON-EVAPOR
TIVE COOLING TOWER SYSTEMS,**
Gilbert Associates, Inc. Reading, Pa.

LIBRARY OF THE UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN

primary bibliographic entry see Field 6G.
-12784

' SHOWING LAKES IN THE GREATER VER AREA FRONT RANGE URBAN COR-OR, COLORADO,
ogical Survey, Denver, Colo.
primary bibliographic entry see Field 7C.
-12795

ES IN THE COLORADO SPRINGS--CAS- ROCK AREA, FRONT RANGE URBAN RIDOR, COLORADO,
ogical Survey, Denver, Colo.
primary bibliographic entry see Field 7C.
-12797

A ON SELECTED LAKES IN WASHING-, PART 4,
ogical Survey, Tucson, Ariz.
primary bibliographic entry see Field 7C.
12808

AT LAKES RESEARCH DIVISION, ONOLOGY OF RESEARCH: 1950 TO THE SENT.
igan Univ., Ann Arbor. Great Lakes arch Div.
58 p.

riptors: *Great Lakes, *Research facilities, ects, *Michigan, Water balance, Lakes, ory, Water quality, Water circulation, Air- interfaces, Meteorology, Ice cover, Cli- Erosion, Sedimentation, Basins, Biology, gical communities, Engineering.

chronology of the research of the Great s Research Division is fundamentally a histo- the works of the Division and its predeces- he Great Lakes Research Institute. It was ned to function primarily as an internal d, summary, and review of the Division's and present research activities and publica- but experience had shown that it (together other Division brochures) is useful to others seek information about the Division. The ology showed, year by year, the research cts held by the Division. The title of each pro- irst appeared under the year in which it was ed; renewed projects were indicated as con- ions and referred back to the initial year a brief project description is given. Each ct was, in its first appearance, back-referred Research Areas section to show its areas of nce. For the convenience of the reader, all ations from a project were listed under the ear of the project regardless of the year of ation. The Chronology of Research was fol- by an Index of Projects by Problem Areas e reader's convenience in locating project ptions and publications. Lists of the serially ered Publications, Contributions, and Spe- Reports of the Division concluded this et. (Sims-ISWS)
2815

OTE SENSING STUDY OF MAUMEE R EFFECTS ON LAKE ERIE,
al Aeronautics and Space Administration, and, Ohio. Lewis Research Center.
imary bibliographic entry see Field 5A.
2819

PARISON OF REQUIRED RESERVOIR AGES COMPUTED BY THE THOMAS-NG MODEL AND THE 'KARLSRUHE EL' TYPE A AND B,
uhe Univ. (West Germany). Institut fuer rbau III.
mary bibliographic entry see Field 4A.
2832

WAVE-INDUCED MASS TRANSPORT IN WATER WAVES,
Delaware Univ., Newark. Dept. of Civil Engineering; and Delaware Univ., Newark. Coll. Marine Studies.
R. A. Dalrymple.
Journal of the Waterways, Harbors and Coastal Engineering Division, American Society of Civil Engineers, Vol. 102, No. WW2, Proceedings Paper 12158, p 255-264, May 1976. 7 fig, 2 tab, 13 ref, 2 append.

Descriptors: *Hydrodynamics, *Flow profiles, *Waves(Water), Coastal engineering, Currents(Water), Velocity, Theoretical analysis, Equations, Mathematical studies, Viscosity, Shear.
Identifiers: *Mass transport, *Wave-current interaction, Wave energy, Velocity distribution, Eulerian mass transport distribution.

The Eulerian mass transport under water waves was studied for an inviscid fluid using finite amplitude wave theories. The distribution of the transport over the water depth for example waves was shown to be confined to a region above the wave trough and to be of lesser magnitude than predicted by Airy wave theory. A measured mean velocity was defined to examine the effect of time-averaging over the duration of immersion, and its variation over the water column was shown. Finally, the presence of a linear shear current in the direction of the wave was shown to alter the total mass transport principally by superposition. (Adams-ISWS)
W76-12844

POLLUTANT AEROSOL DEPOSITION INTO SOUTHERN LAKE MICHIGAN,
Illinois State Water Survey, Urbana. Atmospheric Sciences Section.
For primary bibliographic entry see Field 5B.
W76-12935

LAKE GEORGE SITE SYNTHESIS, 1974-1975.
Rensselaer Polytechnic Inst., Troy, N.Y. Fresh Water Inst.
For primary bibliographic entry see Field 5C.
W76-12937

FLUCTUATIONS OF PHYTOPLANKTON BIOMASS AND ITS COMPOSITION IN A SUB-ARCTIC LAKE DURING SUMMER,
Toronto Univ. (Ontario). Dept. of Botany.
For primary bibliographic entry see Field 5C.
W76-12938

WATER QUALITY INVESTIGATIONS IN A SMALL ARTIFICIAL RESERVOIR,
Arkansas Dept. of Commerce, Little Rock. Div. of Soil and Water Resources.
For primary bibliographic entry see Field 5C.
W76-12943

SOME ECOLOGICAL ASPECTS OF THE CABORA BASSA DAM,
Rhodes Univ., Grahamstown (South Africa). Inst for Freshwater Studies.
For primary bibliographic entry see Field 6G.
W76-12945

IMPACTS OF RECREATIONAL DEVELOPMENT: THE VOYAGER VILLAGE EXPERIENCE,
Wisconsin Planning Office, Madison.
For primary bibliographic entry see Field 6B.
W76-12965

EMISSION OF SULFUR FROM LAKE ONTARIO SEDIMENTS,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 2J.
W76-12987

THERMAL LOADING OF HYCO LAKE, NORTH CAROLINA-- THE EFFECT OF HEATED WATER ON TEMPERATURE AND EVAPORATION, 1966-74,
Geological Survey, Raleigh, N. C.
For primary bibliographic entry see Field 5C.
W76-13078

SUBLACUSTRINE FAN MORPHOLOGY IN LAKE SUPERIOR,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 5B.
W76-13079

INPUTS OF PHOSPHORUS FROM PRECIPITATION TO LAKE MICHIGAN,
DePaul Univ., Chicago, Ill.
For primary bibliographic entry see Field 5B.
W76-13112

EFFECTS OF CHLORINE AND SULFITE REDUCTION ON LAKE MICHIGAN INVERTEBRATES,
Wisconsin Univ., Milwaukee. Center for Great Lakes Studies.
For primary bibliographic entry see Field 5C.
W76-13113

PHYSIOLOGICAL CHANGES DURING THE COURSE OF BLOOMS OF APHANIZOMENON FLOS-AQUAE,
Fisheries and Marine Service, Winnipeg (Manitoba). Freshwater Inst.
For primary bibliographic entry see Field 5C.
W76-13114

POSSIBLE EFFECT OF LOWER PHOSPHORUS CONCENTRATIONS ON THE PHYTOPLANKTON IN ONONDAGA LAKE, NEW YORK, U.S.A.,
State Univ. of New York at Buffalo. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W76-13116

DYNAMICS OF NUMBER AND BIOMASS OF PLANKTONIC INFUSORIA IN OPEN ZONES OF KREMENCHUG RESERVOIR AND THEIR PRODUCTION AND ROLE IN ORGANIC MATTER DESTRUCTION, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.
A. A. Nebrat.
Gidrobiol Zh. 11(2), p 18-27, 1975.

Descriptors: *Plankton, *Biomass, Population, Fish populations, *Organic matter, *Waste assimilative capacity, *Reservoirs.
Identifiers: *Infusoria, Kremenchug Reservoir, Strombidium-gyrans, Strombidium-viride, Tintinnidium-fluviatile, Ukrainian-SSR, USSR.

Seasonal dynamics of infusoria (dominant species: Tintinnidium fluviatile, Strombidium viride, S. gyrans) numbers and biomass and their horizontal distribution and variation in the species composition were studied during the vegetation period of 1972. The Infusoria production for the vegetation period was 39.43 g/m3 (236.6g/2); the average monthly P/B (production/biomass) coefficient, 23. Destruction of organic matter resulting from respiration was equal on the average to 38.6 mg of dry organic matter/1 m3 of water for 24 h, or 7.98 g/m3 of dry (39.9 g/m3 of green) organic matter for the vegetation period (Ukrainian SSR, USSR).--
Copyright 1976, Biological Abstracts, Inc.
W76-13141

CHARACTERISTICS OF THE PRIMARY PRODUCTION IN THE SALMON BREEDING LAKE, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Institut Biologii Vnutrennykh Vod.
For primary bibliographic entry see Field 5C.
W76-13193

QUANTITATIVE DYNAMICS OF BACTERIA IN THE KREMENCHUG RESERVOIR, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.
For primary bibliographic entry see Field 5C.
W76-13195

ZOOPLANKTON POPULATIONS IN THE 'WATER-SPORTBAAN GEORGES NACHEZ' AT GHENT IN 1972, A YEAR OF CONTINUOUS WATERBLOOMING, (IN FLEMISH),
Ghent Rijksuniversiteit (Belgium). Faculteit Landbouwwetenschappen.
For primary bibliographic entry see Field 5C.
W76-13196

2I. Water In Plants

COMPARATIVE STUDIES OF PLANT GROWTH AND DISTRIBUTION IN RELATION TO WATERLOGGING: VII. THE INFLUENCE OF WATER-TABLE FLUCTUATIONS ON IRON AND MANGANESE AVAILABILITY IN DUNE SLACK SOILS,
Trent Univ., Peterborough (Ontario). Dept. of Biology.
R. Jones.
J Ecol. 61(1), p 107-116, 1973.

Descriptors: *Plant growth, *Distribution, *Iron, *Manganese, Seasonal, Soils, Dunes, Water level fluctuation, *Organic matter, Soil profiles.
Identifiers: Agrostis-Sp, Carix-Sp, Equisetum-Sp, *Waterlogging, Watertable.

The possibility that a seasonal trend, associated with flooding, of available Fe and Mn occurred in dune slack soils was investigated. It was found that availability increased when soils were flooded in winter and spring, was highest in early summer, and that it declined with the falling water-tables in late summer. High organic matter content of dune slack soils was associated with high concentrations of available Fe and Mn. The exchangeable iron and manganese content of the soil profile decreased with depth at each of the 3 sites studied (Carex, Agrostis and Equisetum dominants, respectively (Great Britain), corresponding with the decreasing organic matter content down the profile. Total Fe and Mn were greatest in the surface layers, probably as a result of precipitation and the higher organic matter content. The possible effect of Fe and Mn availability on the distribution of dune slack plants is discussed. (See also W72-14874, W73-09063, and W73-09064).--Copyright 1974, Biological Abstracts, Inc.
W76-12708

ENVIRONMENTAL AND CULTURAL PRECONDITIONING EFFECTS ON THE WATER USE RATE OF AGROSTIS PALUSTRIS HUDS., CULTIVAR PENNCROSS,
Michigan State Univ., East Lansing. Dept. of Crop and Soil Sciences.
R. C. Shearman, and J. B. Beard.
Crop Sci. 13(4), p 424-427, 1973.

Descriptors: *Light intensity, *Water temperature, Irrigation, *Nitrogen, Nutrients, *Stomata, Absorption.
Identifiers: *Agrostis-Palustris, Cultivars, Penncross.

Preconditioning effects of light intensity, growing temperature, irrigation frequency, cutting height, mowing frequency, and N nutrition level on water use rate and stomatal density of 'Penncross' creeping bentgrass (A. Palustris) were investigated. Water use rates were recorded as percent moisture lost during exposure to 33C 40% relative humidity, 4300-lux light intensity, and a constant airflow of 186 cm/sec in a special wind tunnel apparatus. Stomatal density counts were made at 430X from the nitrocellulose replications of the leaf surface. The preconditioning effects of cutting height, light intensity, and N nutrition level had the greatest influence on water use rate. Irrigation and mowing frequency were intermediate in their influence. Growing temperature had the least effect among the factors considered. Stomatal density was influenced most by light intensity, and growing temperature had the next greatest effect. Irrigation frequency had an intermediate effect. N nutrition level had the least influence of the factors studied. Water use rate was positively correlated (r = 0.88) to stomatal density in the light intensity study. However, it was negatively correlated (r = -0.98) to stomatal density for the N nutrition level study. No significant correlations were observed for growing temperature or irrigation frequency.--Copyright 1974, Biological Abstracts, Inc.
W76-12723

FINITE DIFFERENCE AND FINITE ELEMENT SIMULATION OF FIELD WATER UPTAKE BY PLANTS,
Institute for Land and Water Management Research, Wageningen (Netherlands).
For primary bibliographic entry see Field 2G.
W76-12830

STUDIES ON HELMINTHS OF NORTH DAKOTA: V. LIFE HISTORY OF PHYLLODISTOMUM NOCOMIS FISCHTHAL, 1942 (TREMATODA:GORGODERIDAE),
Nebraska Univ., Lincoln. Dept. of Zoology.
W. W. Wanson, and O. R. Larson.
J Parasitol. 58(6), p 1106-1109, 1972.

Descriptors: *North Dakota, History, *Trematodes, Clams, *Worms, *Parasites.
Identifiers: *Gorgoderidae, *Helminths, Hybopsis-Biguttata, Notropis-Cornutus, Phyllodistomum-Nocomis, Rhinichthys-Cataractae, Semotilus-Atromaculatus, Sphaerium-Striatinum, *Forest River(ND), Hornyhead chubs.

Sporocysts and cercariae from Forest River, North Dakota, develop inside the gills of the fingernail clam, Sphaerium striatinum, and cercariae encyst within their daughter spoocysts. Metacercariae fed to 4 spp. of minnows (Hybopsis biguttata, Semotilus atromaculatus, Notropis cornutus, Rhinichthys Cataractae) were recovered as immature worms from kidney ducts and urinary bladders of all 4 spp. Only in hornyhead chubs (H. biguttata) did worms mature into egg-bearing adults. The definitive host acquires the parasite by eating infected clams.--Copyright 1973, Biological Abstracts, Inc.
W76-12912

EFFECT OF SUSPENDED COAL PARTICLES ON LIFE FORMS OF AQUATIC MOSS EURHYNCHIUM RIPARIOIDES (HEDW): II. THE EFFECT ON SPORE GERMINATION AND REGENERATION OF APICAL TIPS,
University Coll., Cardiff (Wales). Dept. of Botany.
For primary bibliographic entry see Field 5C.
W76-12913

UTILIZATION OF PETROLEUM YEAST IN FISH FEED: II. EFFECT ON GROWTH AND BODY LIPIDS OF RAINBOW TROUT FINGERLINGS RAISED IN CAGES, (JAPANESE),
Freshwater Fisheries Research Lab., Tok (Japan).
Y. Shimma, and N. Makoto.
Bull Freshwater Fish Res Lab (Tokyo) 24(2), 111-119, 1974.

Descriptors: *Fish food organisms, Fish, *Grow rates, *Rainbow trout, Lipids, Yeasts, Soybea Fry, *Fish diets.
Identifiers: *Petroleum yeasts, Liver lipids, F cages, Cholesterol.

The growth rate of rainbow trout fingerlings rai in small aquaria in previous research was lo Another feeding test was conducted in 0.2-m cages set in a raceway for 42 days and a succe ing 26 days. Test diets were fed to fish on schedule. After the test periods liver and carc lipids were extracted and analyzed for choleste content and fatty acid composition. Average da growth rates with fish meal were 3.1% (form period) and 2.5-2.7% (latter period). Petrole yeast lots showed a lower growth rate and feed ficiency than fish meal lots in the former perio but results as good as those of the meal lots in t latter period. Although addition of 3% grease s tened the pellets feeding results of the grease-su plemented petroleum yeast pellets were inferior those of the non-supplemented pellets. Yeast fr the drainage of soybean cookers contained 45.7 crude protein. Combined feeding of the ye resulted in good fish growth but the lowest feed ficiency among the test diets. The fatty acid p tern of petroleum yeast which contained apprec ble odd-number fatty acids was reflected m distinctly in carcass lipids than in liver lipids. Li lipids from fish fed with diets containing 65% f meal or 3% grease had markedly higher conte of cholesterol than those from fish fed SCP di or non-grease diets.--Copyright 1976, Biologi Abstracts, Inc.
W76-12960

LEAF WATER POTENTIAL AND MOISTU BALANCE--FIELD DATA,
Agricultural Research Service, Auburn, Ala.; a Alabama Agricultural Experiment Station, A burn.
M. G. Huck, V. D. Browning, and R. E. Young.
Presented at the 1975 Winter Meeting of the Am ican Society of Agricultural Engineers, Decemb 15-19, 1975, Chicago, Illinois. 15 p, 6 fig, 2 tab, ref. ASAE Paper 75-2582.

Descriptors: *Root development, *Root distrib tion, *Root system, Soil moisture, Soil water, So water-plant relationships, Irrigation, Irrigati practices, Transpiration.
Identifiers: *Leaf water potential.

The experimental hypothesis that increased ro growth in a larger soil reservoir will make ad tional water available to the plant was tested a largely proved to be true. However, the corrollar based on a suggestion that increased water pote tial will permit a more rapid growth of cott plants, has been cast into serious doubt. If t osmotic component of leaf water potential neglected, the accumulated data from 3 years field experiments strongly suggest that plan growing under these conditions have a slight lower leaf water potential when the availability additional soil water permits growth of a larg plant with a higher transpirational deman (Skogerboe - Colorado State)
W76-13011

PLANT WATER STRESS CRITERIA FOR I RIGATION SCHEDULING,
North Dakota State Univ., Fargo. Dept. Agricultural Engineering.
For primary bibliographic entry see Field 2G.
W76-13024

LIBRARY U. OF I. URBANA-CHAMPAIGN

SECOND LOCALITY FOR NATIVE ALIFORNIA FAN PALMS (WASHINGTONIA (LIFERS) IN ARIZONA,
eological Survey, Tucson, Ariz.
. E. Brown, N. B. Carmony, C. H. Lowe, and R. . Turner.
eprint from Arizona Academy of Science, Vol , No 1, p 37-41, February 1976. 5 fig, 1 tab, 53 f.

escriptors: *Vegetation, *Arid lands, *Arizona, Riparian plants, Springs, Moisture, Arroyos, cological distribution, Phreatophytes, Desert ants.
entifiers: *Washingtonia filifera, *Fan palms, asis vegetation, Sonoran Desert.

ree groves of the California fan palm Vashingtonia filifera Wendl.) located in southern avapai County, Arizona, are described and asons presented for considering the groves na- e. The groves occur near Castle Creek and resent only the second known locality for the ecies in Arizona. The other locality, in the Kofa ountains, lies 185 km (115 mi) to the southwest. us the Castle Creek groves represent a signifi- nt range extension for the species. A map of the own distribution of the palm is presented. oodard-USGS)
6-13069

IYSIOLOGICAL CHANGES DURING THE OURSE OF BLOOMS OF APHANIZOMENON OS-AQUAE,
sheries and Marine Service, Winnipeg anitoba). Freshwater Inst.
r primary bibliographic entry see Field 5C.
6-13114

ROUGHT RESISTANCE OF BLUE GRAMA AS FFECTED BY ATRAZINE AND N. FERTIL- ER,
ricultural Research Service, Fort Collins, Colo.
N. Hyder, W. R. Houston, and J. B. Burwell.
rnal of Range Management, Vol. 29, No. 3, p -216, May 1976. 5 fig, 11 ref.

scriptors: *Drought resistance, *Grama sses, *Nitrogen, *Crop response, Soil-water- nt relationships, Fertilizers, Range grasses, olorado, *Forage grasses.
ntifiers: *Atrazine, Blue gramma, Central ins Experimental Range(Colo).

tudy of blue grama (Bouteloua gracilis) drought istance was conducted during two consecutive mmer roughts at the Central Plains Experimen- Range in north central Colorado. Considerable ning of blue gramma stands (from a frequency 5% in 1970 to 56% in 1973) due to drought con- ons was increased by applicatirazine must uce drought severity by the net effects of weed trol and/or reduced transpiration. Further in- tigation of atrazine's effect is underway. ns-Arizona)
6-13122

NAMICS OF THE ROOT SYSTEM OF BLUE AMA,
VAR Aluminio Argentia, Cangallo. Area In- tigacion y Desarrollo.
res.
rnal of Range Management, Vol. 29, No. 3, p 213, May 1976. 5 tab, 6 fig, 11 ref.

criptors: *Root systems, *Root development, ama grasses, *Soil-water-plant relationships, water, Water requirements, Plant physiology, er utilization, Root zone, *Colorado, *Forage ses.
ntifiers: *Blue grama, US/IBP Pawnee Site orado).

d experiments with blue grama (Bouteloua ilis) were conducted during the 1973 growing season at the US/IBP Pawnee Site in northern Colorado using root observation windows to record root differentiation and growth. Roots began to grow and differentiate shortly before leaf growth was evident. Soil desiccation in mid-growing season caused death and decomposition of 30 to 60% of the newly formed roots. Roots are transient, and their functional development parallels the degree of suberization, with young nonsuberized roots concentrated in soil profile regions where the soil water potential was high to handle water uptake. There was massive root growth near the end of the growing season when soil water potential was high. Root growth late in the season was greatest near the plant's crown, which caused increased root biomass in upper levels of the soil profile as the season progressed. An empirical equation for root growth and development is presented. (Jahns-Arizona)
W76-13123

WATER USE BY DRYLAND CORN AS AFFECTED BY MATURITY CLASS AND PLANT SPACING,
Agricultural Research Service, Mandan, N. D. Northern Great Plains Research Center.
For primary bibliographic entry see Field 3F.
W76-13124

WATER ECONOMY AND DRINKING REGIME OF THE BEDOUIN GOAT,
Tel-Aviv Univ. (Israel). Dept. of Zoology.
For primary bibliographic entry see Field 3C.
W76-13125

PLANT SURVIVAL IN THE ARID SOUTHWEST 30 YEARS AFTER SEEDING,
Arizona State Univ., Tempe.
For primary bibliographic entry see Field 4A.
W76-13128

GENOTYPE VARIATION IN NUTRIENT UPTAKE EFFICIENCY IN CORN,
New York State Univ. Agriculture and Technology Coll. at Cobleskill.
For primary bibliographic entry see Field 3F.
W76-13134

COMPARATIVE ESTIMATION OF THE ROLE OF DETRITUS AND ALGAE IN NEOMYSIS MIRABILIS (CZERNIAVSKY) NUTRITION, (IN RUSSIAN),
Institute of Biology of the Southern Seas, Sevastopol (USSR).
G. A. Pechen'-Finenko, and T. V. Pavlovskaya.
Gidrobiol Zh. 11(2), p 39-44, 1975.

Descriptors: Analytical techniques, *Algae, Diurnal, *Detritus, Waste assimilative capacity, Aquatic animals, Carbon radioisotopes, Estimating, Aquatic plants.
Identifiers: Gymnodinium-kowalerskii, *Gymnodinium-spp., *Neomysis-mirabilis, Peridineae, *Radiocarbon method.

The efficiency of the nutrition of N. mirabilis on vegetative and animal detritus, melanin and living Peridineae algae was determined by the radiocarbon method. The diurnal value of the 'index of filling' of 4 suggested foods was highest for the living algae Gymnodinium kowalevskii; animal detritus was consumed more effectively than vegetative detritus. The diurnal ration value of the animals with an excess Gymnodimium concentration was 15.7 and 30 times as high as detritus and melanin diurnal rations. Balance experiments concerning the dependence of algae consumption and assimilation on concentration, showed that only the highest of the suggested concentrations (1.6 mg/l of green weight) can meet the food requirements of N. mirabilis.--Copyright 1976, Biological Abstracts, Inc.
W76-13149

2J. Erosion and Sedimentation

BLUFF EROSION, RECESSION RATES, AND VOLUMETRIC LOSSES ON THE LAKE MICHIGAN SHORE IN ILLINOIS,
Illinois State Geological Survey, Urbana.
R. C. Berg, and C. Collinson.
Environmental Geology Notes, Report EGN 76, No. 76, July 1976, 33 p, 19 fig, 10 tab, 14 ref.

Descriptors: *Erosion, *Erosion rates, Bank erosion, *Lake Michigan, *Lake shores, Shore protection, Littoral drift, Sediments, Shoreline cover, Geology, Groundwater, *Illinois.

Significant bluff erosion is apparent at more than 21 sites on the Illinois shore of Lake Michigan between Winnetka and Waukegan. The Lake Bluff shore was studied in some detail to determine what characteristics contribute to its instability and recession. It was concluded that the recession can be attributed to high lake levels bluff denudation, inadequate shore protection, weakness of earth materials in the bluffs, oversteep slopes, excessive water pressure affecting groundwater quantity and gradient, surface drainage and seepage, and lack of littoral drift sediments and the resultant absence of protective beaches. (Chilton-ORNL)
W76-12686

A BRIEF HYDROLOGIC APPRAISAL OF THE JULY 3-4, 1975, FLASH FLOOD IN LAS VEGAS VALLEY, NEVADA.
Geological Survey, Carson City, Nev.
For primary bibliographic entry see Field 4A.
W76-12806

BEACH DYNAMICS AND NEARSHORE MORPHOLOGY OF THE BEAUFORT SEA COAST, ALASKA,
Arctic Inst. of North America, Arlington, Va.
For primary bibliographic entry see Field 2L.
W76-12820

EROSION AND TRANSPORT OF BED-LOAD SEDIMENT,
Koninklijke Shell Exploratie en Produktie Laboratorium, Rijswijk (Netherlands).
R. F. Luque, and R. van Beek.
Journal of Hydraulic Research, Vol. 14, No. 2, p 127-144, 1976. 10 fig, 15 ref.

Descriptors: *Bed load, *Erosion, *Sediment transport, Deposition(Sediments), Saltation, Sands, Gravels, Hydraulics, Equations, Mathematical studies, Laboratory tests, Scour.
Identifiers: *Mean critical shear stress, *Nonceasing scour, Average particle velocity, Shield grain-movement condition, Magnetite grain, Walnut grain.

Results of a series of experiments were presented in which were measured: the mean critical bed shear stress at SHIELDS' grain-movement condition and at the initiation of non-ceasing scour, the rate of bedload transport, the average particle velocity, the rate of deposition, and the average length of individual steps of saltating bed-load particles, in water, as a function of the time-mean bed shear stress. These experiments were performed in a closed rectangular flow channel at different slopes of the bed surface and using five different bed materials (two sands, gravel, magnetite and walnut grains). A comparison of the threshold drag acting at different downward slopes of the bed surface (0, 12, 18 and 22 degrees) resulted in a surprisingly large critical-drag angle of 47 degrees. The initiation of non-ceasing scour of a loose granular bed was studied experimentally behind a consolidated bed of the same material as the loose bed. The corresponding instantaneous threshold drag was about three times larger than the threshold drag acting at SHIELDS' grain movement condition. The rate of bed-load transport

measured as a function of the mean bed-shear stress satisfied a generalized MEYER-PETER and MULLER formula (1948), also at various downward slopes of the bed surface, as investigated up to 22 degrees. The rate of particle deposition was found to be proportional to the rate of bed-load transport, and the average length of individual particle steps was found to be a constant. This implied that the probability of a bed-load particle being deposited when striking the bed surface is independent of the flow rate within the experimental range. This result contradicted EINSTEIN'S theory of bed-load transport (1950). (Lee-ISWS)
W76-12827

NEW DIVER-OPERATED BEDLOAD SAMPLER,
Georgia Inst. of Tech., Atlanta. Dept. of Geophysical Science.
D. G. Waslenchuk.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 102, No. HY6, Proceedings Paper 12179, p 747-757, June 1976. 1 fig, 4 tab, 8 ref, 2 append.

Descriptors: *Bed load, *Channels, *Bed load samplers, *Sampling, *Sediment discharge, Streams, Scuba diving, Sands, Equation, Instrumentation, On-site investigations.
Identifiers: *Diver-operated samplers.

The paper described a scuba-diver operated sampler for the measurement of bedload discharge in any stream. This was a portable pit type sampler which was pushed into the riverbed by a diver. Sediment particles were deposited in the sampler as they were transported over the leading edge of the wedge-shaped cavity. The sampler opening was adjustable in size. In the testing, the sampler performed well compared to the dune-tracking method of bedload sampling. (Bhowmik-ISWS)
W76-12972

EMISSION OF SULFUR FROM LAKE ONTARIO SEDIMENTS,
Canada Centre for Inland Waters, Burlington (Ontario).
J. O. Nriagu, and R. D. Coker.
Limnology and Oceanography, Vol. 21, No. 4, p 485-489, July 1976. 1 fig, 1 tab, 21 ref.

Descriptors: Sulfur, *Sulfur compounds, *Lake Ontario, *Lake sediments, *Sediments, *Great Lakes, Hydrogen sulfide, Analytical techniques, Inorganic compounds, Water quality, Surface waters, Lakes, Bottom sediments, Analysis, Chemistry, Mass spectrometry, Instrumentation, Equations, Mathematical studies.
Identifiers: *Sulfur emissions(Sediments), *Lake Ontario sediments, *Lake Ontario basin, *Volatile sulfur compounds, *Sulfur cycle, Lacustrine sediments, Benthos corer, Analytical methods, Analytical procedures, Isotope-ratio mass spectrometer, Sulfur 32, Sulfur 34, Elemental sulfur, Sulfur release.

Calculations indicated that about 600,000 kg of sulfur is released annually from Lake Ontario sediments. It was concluded that this constitutes about 1 percent of the annual sulfur input into the sediments and is insignificant compared to the total sulfur that cycles annually through the lake. Also, the sulfur released from the sediments is enriched in S32 with the result that the sulfur in the historical layers is characterized by high delta S34 values. (Henley-ISWS)
W76-12987

CHANGES OCCURRING IN THE OCEANIC PORTION OF THE COLVILLE RIVER DELTA, ALASKA, DURING SPRING FLOODING,
Louisiana State Univ., Baton Rouge. Dept. of Geography and Anthropology; and Louisiana State Univ., Baton Rouge. Coastal Studies Inst.
For primary bibliographic entry see Field 2C.
W76-12997

SEDIMENT FROM DRAINAGE SYSTEMS FOR A HEAVY SOIL,
Ohio State Univ., Columbus. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 3F.
W76-13001

PHYSICAL-CHEMICAL COMPOSITION OF ERODED SOIL,
Purdue Univ., Lafayette, Ind. Dept. of Agricultural Engineering.
E. J. Monke, H. J. Marelli, L. D. Meyer, and J. F. DeJong.
Presented at the 1975 Winter Meeting of the American Society of Agricultural Engineers, December 15-19, 1975, Chicago, Illinois. 11 p, 3 fig, 5 tab, 7 ref. ASAE Paper 75-2584.

Descriptors: *Runoff, *Particle size, Erosion, *Erosion rates, Soil tests, Soil investigations, *Soil erosion, Soil properties, Water quality, Cultivation, Simulated rainfall, Pollutant identification, *Water loss, Indiana.
Identifiers: *Maumee River basin(Ind).

Water loss by runoff, soil loss in runoff, particle size distribution in the eroded soil material, and the water quality of runoff containing eroded soil materials were measured from soil surfaces subjected to simulated rainfall. Three soils from the Maumee River Basin under two extreme tilth conditions were selected. (Skogerboe - Colorado State)
W76-13010

VARIATION OF SUSPENDED SEDIMENT LOAD IN THE PALOUSE REGION OF THE NORTHWEST,
For primary bibliographic entry see Field 5G.
W76-13012

SUSPENDED SEDIMENT AND TURBIDITY IN IRRIGATION RETURN FLOWS - A PROTOTYPE STUDY,
Soil Conservation Service, Spokane, Wash.
For primary bibliographic entry see Field 5B.
W76-13017

SUBLACUSTRINE FAN MORPHOLOGY IN LAKE SUPERIOR,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 5B.
W76-13079

TECHNIQUES IN EVALUATING SUITABILITY OF BORROW MATERIAL FOR BEACH NOURISHMENT,
Coastal Engineering Research Center, Fort Belvoir, Va.
For primary bibliographic entry see Field 8B.
W76-13175

2K. Chemical Processes

GROUND-WATER BASIC DATA FOR DUNN COUNTY, NORTH DAKOTA.
Geological Survey, Bismarck, N. Dak.
For primary bibliographic entry see Field 7C.
W76-12786

MAP SHOWING AVAILABILITY OF HYDROLOGIC DATA PUBLISHED BY THE U. S. ENVIRONMENTAL DATA SERVICE, AND BY THE U.S. GEOLOGICAL SURVEY AND COOPERATING AGENCIES, GREATER DENVER AREA, FRONT RANGE URBAN CORRIDOR, COLORADO.
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 7C.
W76-12794

GEOCHEMICAL CONTROLS ON LEAD CO CENTRATIONS IN STREAM WATER A SEDIMENTS,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 5A.
W76-12800

A HYPOTHESIS OF ION FILTRATION IN POTABLE-WATER AQUIFER SYSTEM,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 4B.
W76-12803

DATA ON SELECTED LAKES IN WASHIN TON, PART 4,
Geological Survey, Tucson, Ariz.
For primary bibliographic entry see Field 7C.
W76-12808

CHEMICAL DYNAMICS OF A POLLUT WATERSHED, THE MERRIMACK RIVER NORTHERN NEW ENGLAND,
Massachusetts Inst. of Tech., Cambridge. Dept Earth and Planetary Sciences.
For primary bibliographic entry see Field 5B.
W76-12833

ATMOSPHERIC INPUT OF SOME CATIO AND ANIONS TO FOREST ECOSYSTEMS NORTH CAROLINA AND TENNESSEE,
Forest Service (USDA), Franklin, N.C. Cowe Hydrologic Lab.
W. T. Swank, and G. S. Henderson.
Water Resources Research, Vol. 12, No. 3, p 5 546, June 1976. 3 fig, 2 tab, 23 ref. AG-199, 40-1 69.

Descriptors: Chemical properties, *Falle *Precipitation(Atmospheric), *Appalachian mo tain region, *Forest watersheds, *North Caroli *Tennessee, *Southeast U.S., Rain, Fore Snow, Rainfall, Ions, Water quality, *Anio *Cations, On-site data collections, *Atmosphe Seasonal.
Identifiers: Atmospheric input, Mineral c stituent, Forest ecosystems, Atmospheric c tributions, Southern Appalachians, Cowe Basin, Walker Branch, Dry fallout, Nutrient inp

The atmospheric contributions of elements precipitation and dry fallout to forest ecosyste were measured at two sites in the southern palachians. At both sites, relative mean ann concentrations of cations in bulk precipitat were in the order Ca is greater than Na is grea than K is greater than Mg. At the Cowe Hydrologic Laboratory in North Carolina, aver annual inputs of Ca(++), Na(+), K(+), Mg(+ and NH4-N in 1970-1973 were 4.88, 3.52, 1. 1.01, and 0.52 kg/ha/yr, respectively. At Wal Branch, Tennessee, the inputs of these eleme during the same time period were 15.73, 3.89, 2. 2.94, and 2.37 kg/ha/yr. The inputs of NO3 PO4-P, and Cl(-) in 1972-1973 were 2.88, 0.19, 8.53 kg/ha/yr at Coweeta. Inputs of NO3-N PO4-P were 4.61 and 0.55 kg/ha at Walker Bra over the same period. One reason for differen in bulk precipitation chemistry was greater dry lout for some cations at Walker Branch than Coweeta. For both sites, dry fallout associa with local land use activities influenced seaso concentrations of bulk precipitation except Na(+), which appeared to be partly derived fr marine sources. Total inputs of elements w considered to be minimum estimates for b forest ecosystems due to sampling and analyti methods. (Henley-ISWS)
W76-12838

EMISTRY OF HALOGENS IN SEAWATER,
ntiel School of Marine and Atmospheric
ice, Miami, Fla.
primary bibliographic entry see Field 5A.
-12884

UTE DISPERSION IN SATURATED SOIL UMNS,
ecticut Agricultural Experiment Station,
s. Dept. of Soil and Water.
rimary bibliographic entry see Field 5B.
12986

UND-WATER QUALITY VARIATION IN LPS COUNTY, MISSOURI,
st Service (USDA), Rolla, Mo. Clark National
st.
rimary bibliographic entry see Field 5B.
12991

OSPHERIC AEROSOLS: A LITERATURE MARY OF THEIR PHYSICAL CHARAC-STICS AND CHEMICAL COMPOSITION,
Dominion Univ., Norfolk, Va. School of
ces.
rimary bibliographic entry see Field 5A.
12996

LABILITY OF GROUND WATER IN THE LE CONNECTICUT RIVER BASIN, T-CENTRAL NEW HAMPSHIRE,
gical Survey, Concord, N. H.
rimary bibliographic entry see Field 7C.
13062

MPOUNDMENT WATER QUALITY OF TOWN BRANCH JUNIATA RIVER AND TRIBUTARY STREAMS, SOUTH-CEN-PENNSYLVANIA,
gical Survey, Harrisburg, Pa.
imary bibliographic entry see Field 5A.
3065

URRENCE OF ARSENIC IN THE DRY K BASIN, SONOMA COUNTY, CALIFOR-

gical Survey, Menlo Park, Calif.
imary bibliographic entry see Field 5A.
3068

OGY AND GROUND-WATER URCES OF UNION COUNTY, NEW JER-

gical Survey, Trenton, N. J.
imary bibliographic entry see Field 4B.
3072

YDROLOGY OF THE OKLAHOMA PAN-LE, BEAVER, CIMARRON, AND TEXAS TIES,
gical Survey, Oklahoma City, Okla.
mary bibliographic entry see Field 4B.
3081

CAL TEMPERATURE AND CHEMICAL IENTS IN GROUNDWATER IN THE ON BASIN, ARIZONA,
a Univ., Tucson. Dept. of Hydrology and
Resources.
mary bibliographic entry see Field 4B.
129

Estuaries

-LINEAR PROGRAMMING MODEL FOR JATING WATER SUPPLY POLICIES IN EXAS COASTAL ZONE,
Univ. at Austin.

For primary bibliographic entry see Field 6D.
W76-12680

EFFECTS OF 1973 RIVER FLOOD WATERS ON BROWN SHRIMP IN LOUISIANA ESTUARIES,
Louisiana Wildlife and Fisheries Commission, New Orleans. Div. of Oysters, Water Bottoms and Seafoods.
For primary bibliographic entry see Field 5C.
W76-12693

ON THE COEXISTENCE OF SCAVENGERS ON SHALLOW SANDY, BOTTOMS IN GULLMAR FJORD (SWEDEN), ADAPTATIONS TO SUBSTRATUM, TEMPERATURE, AND SALINITY,
Uppsala Univ. (Sweden). Inst. of Zoology.
For primary bibliographic entry see Field 5C.
W76-12704

PHYSIOLOGICAL ECOLOGY OF FOUR POLYSIPHONIA SPECIES (RHODOPHYTA, CERAMIALES),
New Hampshire Univ., Durham. Jackson Estuarine Lab.; and New Hampshire Univ., Durham. Dept. of Botany.
For primary bibliographic entry see Field 5C.
W76-12705

SOME CURRENT DIRECTED MOVEMENTS OF MACROBRACHIUM ACANTHURUS (WIEGMANN 1836) (DECAPODA, PALAEMONIDAE) UNDER LABORATORY CONDITIONS,
Rosenstiel School of Marine and Atmospheric Science, Miami, Fla.
D. A. Hughes, and J. D. Richard.
Ecology. 54(4), p 927-929, 1973.

Descriptors: *Larvae, *Shrimp, Brackish water, Estuaries, Migration, *Salinity.
Identifiers: Decapoda, *Macrobrachium-acanthurus, Palaemonidae.

The larvae of some species of freshwater shrimp of the genus Macrobrachium will develop only in brackish water. The increased incidence of these shrimp within estuaries and in the lower reaches of rivers at certain times of the year suggests that regular downstream migrations are carried out to facilitate the transport of larvae to a brackish estuarine environment. Current chamber experiments conducted in the laboratory indicated that gravid individuals tend to swim consistently downstream whereas other adult females tend to swim consistently upstream. Other current chamber experiments showed that larval stages, held in brackish water, will drop to a position low in the water column when salinity is reduced (simulating an ebb tide) and revert to swimming higher in the water column when the salinity is increased (simulating a flood tide). These responses are interpreted as a mechanism whereby larvae are prevented from being carried out to sea, thus facilitating their eventual migration upstream to a freshwater environment.--Copyright Biological Abstracts, Inc., 1974.
W76-12707

DISTRIBUTION OF PELAGIC FISHES IN THE SHEEPSCOT RIVER-BACK RIVER ESTUARY, WISCASSET, MAINE,
Maine Univ., Orono. Dept. of Zoology.
C. W. Recksiek, and J. D. Mc Cleave.
Trans Am Fish Soc. 102(3), p 541-551, 1973.

Descriptors: *Distribution, Fish, *Maine, *Estuaries.
Identifiers: Alosa-aestivalis, Alosa-mediocris, Alosa-pseudoharengus, Alosa-sapidissima, Brevoortia-tyrannus, Clupea-harengus, Merluccius-bilinearis, Morone-Americana, Morone-saxatilis, Osmerus-mordax, Peprilis-triacias, Pollachius-virens, Pomatomus-saltarix, Scomber-scombrus, Squalus-acanthias, Wiscasset(Maine), Back River, Sheepscot River, *Pelagic fishes.

Species (15) of pelagic fishes (Alosa sapidissima, A. mediocris, A. pseudoharengus, A. aestivalis, Clupea harengus, Osmerus mordax, Brevoortia tyrannus, Scomber scombrus, Squalus acanthias, Morone saxatilis, Merluccius bilinearis, Peprilis triacanthus, Pomatomus saltatrix Pollachius virens, Morone Americana) were collected in 156 gill net sets at 8 locations in the Sheepscot River-Back River estuary, Wiscasset, Maine, June 1970 through Dec. 1971. Highest catches occurred June through Aug. Only the rainbow smelt is a year-round resident. Differences in abundance in space and time are apparently related to temperature. During the summer, alewives, blueback herring, and Atlantic menhaden were most abundant in the relatively warm Back River estuary, while Atlantic herring, Atlantic mackererel and spiny dogfish were most abundant in the more oceanic Sheepscot River estuary. Prolonged near-freezing temperature apparently limit the time pelagic fishes spend in the estuary and limit the number of species which can inhabit it. It is hypothesized that the distribution of pelagic species which exhibited preferences for colder water, such as Atlantic herring, would be most affected by artificial warming of the surface waters of the Back River estuary if a new atomic powered generating plant were allowed to discharge heated effluent directly into it.--Copyright 1974, Biological Abstracts, Inc.
W76-12710

CADMIUM CONCENTRATIONS IN ROCK SCALLOPS IN COMPARISON WITH SOME OTHER SPECIES,
California Univ., Livermore. Lawrence Livermore Lab.
For primary bibliographic entry see Field 5C.
W76-12715

SPAWNING LITTORINA LITTOREA (L.) (GASTROPODA: PROSOBRANCHIATA),
University Coll. of North Wales, Menai Bridge. Marine Science Labs.
For primary bibliographic entry see Field 5C.
W76-12725

GROWTH AND MORTALITY OF TWO GROUPS OF OYSTERS, (CRASSOSTREA VIRGINICA GMELIN), MAINTAINED IN COOLING WATER AT AN ESTUARINE ELECTRIC POWER GENERATING STATION,
Moody Coll. of Marine Sciences and Maritime Research, Galveston, Tex. Dept. of Marine Sciences.
For primary bibliographic entry see Field 5C.
W76-12726

REPRODUCTION AND RECRUITMENT OF THE BRACKISH WATER CLAM RANGIA CUNEATA IN THE JAMES RIVER, VIRGINIA,
Nuclear Regulatory Commission, Washington, D.C. Div. of Technical Review.
For primary bibliographic entry see Field 5C.
W76-12728

FISH INVESTIGATIONS IN LONG ISLAND SOUND AT A NUCLEAR POWER STATION SITE AT SHOREHAM, NEW YORK,
New York State Dept. of Environmental Conservation, Albany.
C. S. Zawacki, and P. T. Briggs.
New York Fish and Game Journal, Vol. 23, No. 1, p 35-50, 1976, 9 tab, 3 fig, 12 ref.

Descriptors: *Fish populations, *Nuclear powerplants, Sites, Atlantic menhaden, Silversides, Fish, Seasonal, Pesticides, Chlorine, Trace elements, Thermal pollution, New York, Sounds.
Identifiers: Scup, Bluefish, *Long Island Sound(NY).

The purpose was to gather information on the species of fish found near the station site, their relative and seasonal abundance and their size ranges. The shore-zone waters serve seasonally as a nursery ground for several species, particularly Atlantic silverside and Atlantic menhaden. Near shore waters are important summer grounds for scup and juvenile bluefish. Specimens of two migratory (striped bass and juvenile bluefish) and one resident (windowpane) species examined showed low concentrations of DDT and its metabolites, dieldrin and trace metals. It was recommended that cooling water discharged into Long Island Sound should not exceed standards set forth by the State Department of Environmental Conservation, that shut downs for normal maintenance be scheduled at times other than winter months to prevent fishkill from sudden cold, and that the use of chlorine-bearing compounds to prevent fouling be undertaken with caution. (Chilton-ORNL)
W76-12743

OBSERVATIONS ON FISHES KILLED BY COLD AT PORT ARANSAS, TEXAS, 11-12 JANUARY 1973,
Texas Univ. at Austin, Port Aransas. Marine Science Inst.
R. H. Moore.
The Southwestern Naturalist, Vol. 20, No. 4, January 1976, p 461-466, 1 tab, 15 ref.

Descriptors: *Environmental effects, *Weather, Temperature, Fish, *Fishkill, *Thermal stress, Mortality, Estuaries, *Texas, Water temperature.

Cold-lethal temperatures for striped mullet, red drum, sheepshead, and most other common Texas estuarine fish appear to be about 4.5 C, while activity was severely limited at temperatures below 6-7.0 C. In the case of the cold front under discussion it was concluded that mortality due to cold was limited to fish trapped in enclosed waters such as marinas. Mortalities appeared to be due to the rapid decrease in temperature rather than to prolonged exposure to cold. Slower temperature decreases might have provided more time for acclimation and the observed cold-lethal temperatures might then be lowered. (Chilton-ORNL)
W76-12744

RECENT CYCLIC CHANGES IN CLIMATE AND IN ABUNDANCE OF MARINE LIFE,
Marine Biological Association of the United Kingdom, Plymouth (England).
For primary bibliographic entry see Field 5C.
W76-12747

THE BLUE CRAB FISHERY IN MISSISSIPPI,
Gulf Coast Research Lab., Ocean Springs, Miss.
H. M. Perry.
Gulf Research Reports, Vol. 5, No. 1, 1975, p 39-75, 9 fig, 5 tab, 51 ref.

Descriptors: *Fisheries, *Estuarine fisheries, *Crabs, Growth stages, *Overwintering sites, *Mississippi, Parasites.

670 samples obtained by trawl, seine, and marsh net from July 1971 through June 1973 were analyzed. Salinities ranging from 5.0 to 15.0 ppt at temperatures of 20.0 to 25.0 C were associated with highest average catches. Young crabs were most often found over soft mud bottoms in dredged navigational channels and marshes fringing the bays and coastline. Peak numbers of zoeae occurred in the summer and fall. Megalopae were found throughout the year but were most abundant in September 1970, February 1971, and August 1972. A tagging program in Lake Borgne in the fall of 1971 showed that crabs tagged and released in that vicinity moved into Mississippi Sound near Cat Island to overwinter while crabs released in the St. Louis Bay, Biloxi Bay and Pascagoula River estuarine systems showed little movement during spring and summer. Identified parasites included a new microphallid trematode. (Chilton-ORNL)
W76-12749

BEHAVIOR OF LOBSTERS (HOMARUS AMERICANUS) IN A SEMI-NATURAL ENVIRONMENT AT AMBIENT TEMPERATURES AND UNDER THERMAL STRESS,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 5C.
W76-12761

SKELETONEMA MENZELII SP. NOV., A NEW DIATOM FROM THE WESTERN ATLANTIC OCEAN,
Woods Hole Oceanographic Institution, Mass.
R. R. L. Guillard, E. J. Carpenter, and B. E. F. Reimann.
Phycologia, Vol 13, No. 2, 1974, p 131-138, 12 fig, 18 ref. NSF GB 7682 GB 20488, GZ 1131, GZ 1131, GA 379

Descriptors: Biology, *Systematics, *Diatoms, *Atlantic Ocean.
Identifiers: *Sargasso Sea, *Skeletonema menzelii.

Skeletonema menzelii is related to S. costatum and S. tropicum but distinguished from them by smaller cell size, fragility of shells, shorter chain length, and irregular spacing of cells which are usually lenticular in shape. It has at most two chloroplasts per cell. The valves have 5-14 marginal strutted tubuli and a single, generally central labiate process. The valve has a pattern of fine radiate thickenings over a finely perforate silica membrane. (Chilton-ORNL)
W76-12766

TORTUGUERO BAY ENVIRONMENTAL STUDIES,
Puerto Rico Nuclear Center, Mayaguez.
For primary bibliographic entry see Field 6G.
W76-12783

BEACH DYNAMICS AND NEARSHORE MORPHOLOGY OF THE BEAUFORT SEA COAST, ALASKA,
Arctic Inst. of North America, Arlington, Va.
A. D. Short, J. M. Coleman, and L. D. Wright.
Available from the National Technical Information Service, Springfield, VA 22161, as AD-A-009 032, $3.50 in paper copy, $3.00 in microfiche. Technical Report No. 185, June 1975. 15 p, 10 fig, 14 ref. NR 388 110. N00014-69-A-0211-0005.

Descriptors: *Barrier islands, *Currents(Water), *Alaska, *Beaches, Waves(Water), Beach erosion, Geomorphology, Inlets(Waterways), Tidal waters, Tides, Estuaries, Migration.
Identifiers: *Beaufort Sea, *Beach dynamics, *Nearshore morphology, Freezeup, Lagoon ice slush, Ice boulders, Frozen swash.

The beach dynamics and nearshore morphology of the Alaskan Beaufort Sea coast between Point Barrow and Demarcation Point were examined. The following conditions were found to exist: the beaches along the Beaufort Sea are subjected to wave and current action for a maximum of 3 months each year, and during this period they can be classified as wave-controlled forms. Beach volume changes during the open water period are increased by an order of magnitude during infrequent summer storms. Net longshore beach transport is toward the west and is about 10,000 cu m per year. Waves and currents have generated echelon offshore bars that occupy approximately 40% of the coast. The bars extend laterally from the shore to distances of 400 to 600 m seaward, they attain lengths of 2 to 10 km, and some are migrating westward at an average of 70 m per year. Their presence and migration have a pronounced effect on the beach and barrier island morphol
especially the width, and on the location
migration of the dynamic barrier inlets. The ba
islands are migrating westward at 6 to 25 m
year. On tundra islands, this migration result
permanent destruction of the tundra. If wave
tion persists into freezeup, then lagoon ice sl
ice boulders, frozen swash, foam and spray,
snow may be interbedded and preserved within
beach sediments. Later in freezeup, sea ice ri
may occur against the beach shorefast ice and
offshore bars, permitting the beach and bars t
readily discernible during winter by air recon
sance and from aerial photographs. (Lee-ISWS
W76-12820

**EXPERIMENTAL STUDY OF TURBUL
STRATIFIED SHEARING FLOW,**
McGill Univ., Montreal (Quebec). Dept. of
Engineering and Applied Mechanics.
V. H. Chu, and M. R. Vanvari.
Journal of the Hydraulics Division, Amer
Society of Civil Engineers, Vol. 102, No. H
Proceedings Paper 12205, p 691-706, June 197
fig, 1 tab, 15 ref, 2 append. NRCC A7922.

Descriptors: *Entrainment, Hydrau
*Stratified flow, *Mixing, *Interfaces, Equat
Velocity, Density, Laboratory tests, Turbule
Conductivity, Anemometers, Jets, Saline w
Water pollution, Supercritical flow, *Path of
lutants.
Identifiers: *Turbulent shearing flow, De
jump, Richardson number.

Two-dimensional turbulent stratified shea
flow of lighter fluid flowing on top of an other
stationary ambient fluid of heavier density
simulated in the laboratory by letting fresh w
flow over the stationary body of saline water.
behavior of the turbulent surface layer was
served to depend on upstream condition as we
downstream condition in a manner similar to
free surface flow in open channel. Velocity
concentration were measured by hot
anemometer and conductivity probe. It was
served that a 'density jump' analogous to
open-channel hydraulic jump exists. Upstrea
the jump the flow was jet-like and was cha
terized by turbulent mixing and entrainm
similar to a neutral wall jet. This region
referred to as supercritical since it was observ
be influenced by the upstream condition
Downstream of the jump the flow was di
guished by sharp interface with negligible ent
ment. Mixing in the region of the density jump
more complicated. (Singh-ISWS)
W76-12841

COASTAL DISPERSION OF POLLUTANTS,
Polish Academy of Sciences, Gdansk. Ins
Hydraulic Research.
For primary bibliographic entry see Field 5B.
W76-12843

**ENVIRONMENTAL SURVEY OF TWO
TERIM DUMPSITES--MIDDLE ATLAN
BIGHT.**
Environmental Protection Agency, Annap
Md. Annapolis Science Center.
For primary bibliographic entry see Field 5B.
W76-12875

**CONTRIBUTION ON THE KNOWLEDGE
THE ORGANIC IN THE COASTAL WAT
OF THE GDR: V. THE VARIABILITY OF
CHEMICAL OXYGEN CONSUMPTION
SELECTED STATIONS OF THE WATERS
THE SHALLOW INLETS TO THE SOUTH
THE ZINGST PENINSULA DURING
SYNOPTIC INVESTIGATION IN 1972, (IN G
MAN),**
Rostock Univ. (East Germany). Dept. of Biolo
For primary bibliographic entry see Field 5B.
W76-12916

LIBRARY U. OF I. URBANA-CHAMPAIGN

OF METALS IN WASTEWATER HARGE TO OCEAN,
Inc., Pasadena, Calif.
rimary bibliographic entry see Field 5B.
12927

IFICANCE OF CELLULAR NITRATE TENT IN NATURAL POPULATIONS OF INE PHYTOPLANKTON GROWING IN BOARD CULTURES,
e Universitaire de Luminy, Marseille ce). Laboratoire d'Oceanographie.
imary bibliographic entry see Field 5C.
2936

STAGES TOWARDS RANCHING SAL-ON OCEAN RANGES,
ational Aquaculture Consultancy, Isle of England).
imary bibliographic entry see Field 6B.
2949

SOCIAL AND ECONOMIC IMPORTANCE HE CARONI SWAMP IN TRINIDAD AND GO,
gan Univ., Ann Arbor. Dept. of Natural rces.
imary bibliographic entry see Field 6G.
2952

STIMATION OF TOTAL PRODUCTION LANKTONIC COPEPODS IN NERITIC OF THE GOLFE DULION (BANYULS-IER): I. QUANTITATIVE ANNUAL ATION, (IN FRENCH),
Lab., Banyuls-sur-Mer (France).
imary bibliographic entry see Field 5C.
2954

IENT FLUSHING AFTER DREDGING IN BAYS,
Inst. of Tech., Stockholm (Sweden). Dept. raulics.
mary bibliographic entry see Field 8C.
2974

LUMETRIC TEMPERATURE/SALINITY JS FOR THE MIDDLE ATLANTIC
Hole Oceanographic Institution, Mass.
Wright, and C. E. Parker.
logy and Oceanography, Vol. 21, No. 4, p ., July 1976. 4 fig, 2 tab, 17 ref. NSF GA

ptors: *Salinity, *Temperature, nental shelf, *Water quality, *Atlantic Physical properties, Water temperature, ties, Thermocline, Chemical properties, vater, Water chemistry, Saline water, , Marine geology, Continental slope, Struc-ology, Estuarine environment.
ers: Temperature/salinity census, *Middle Bight, Shelf water volume, Coastal *Cape Hatteras, *Nantucket shoals, Seasonal variation, Coastal runoff, En-ental influences, Volumetric diagrams, rature/salinity, Seasonal changes, Shelf Slope water.

asonal volumetric temperature/salinity dia-were prepared for the waters of the Middle Bight from Nantucket Shoals to Cape s, to a depth of 200 m and extending as 130 km beyond the edge of the continental otal volume included was 23,145.6 cu km, h about half is slope water, more saline ,000 mg/l. Most of it was in a distinctive ace maximum region near 13C, which is he upper slope water thermostat. The less helf water had two modes divided by a n near 33,600 mg/l. The fresher mode, as-sociated with shallow depths, was identified as coastal water; that from 33,600-35,000 mg/l was called shelf edge water, and much of it is found seaward of the shelf break. There was very little seasonal change in the total volume of shelf water, but its geographical distribution varied, showing the effects of spring runoff and suggesting a summer influx of slope water in the northern portion of the bight. Comparison with a similar census for the Gulf of Maine and shelf waters to the east showed some overlap, but little evidence of substantial exchange. (Henley-ISWS)
W76-12990

SURFACE WATER TEMPERATURES AT SHORE STATIONS, UNITED STATES WEST COAST, 1973.
Scripps Institution of Oceanography, La Jolla, Calif.
For primary bibliographic entry see Field 7C.
W76-12995

CHANGES OCCURRING IN THE OCEANIC PORTION OF THE COLVILLE RIVER DELTA, ALASKA, DURING SPRING FLOODING,
Louisiana State Univ., Baton Rouge. Dept. of Geography and Anthropology; and Louisiana State Univ., Baton Rouge. Coastal Studies Inst.
For primary bibliographic entry see Field 2C.
W76-12997

ANNOTATED BIBLIOGRAPHY ON THE GEOLOGIC, HYDRAULIC, AND ENGINEERING ASPECTS OF TIDAL INLETS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
J. H. Barwis.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A020 355, $3.50 in paper copy, $3.00 in microfiche. GITI Report 4, January 1976. 340 p.

Descriptors: *Bibliographies, *Inlets(Waterways), *Hydraulics, *Coasts, Abstracts, Publications, Channels, *Estuaries, Tides, Surface waters, Littoral, *Coastal engineering, Geology, Stratigraphy, Tidal effects, Engineering structures.

Abstracts and annotations were given for about 1000 published and unpublished reports, dated 1973 and earlier, on the geologic and engineering aspects of tidal inlets. Insofar as they relate to inlets, references were given on tidal hydraulics, engineering structures, littoral processes, stratigraphy and geologic history, coastal aerial photography, and Corps of Engineers reports of investigation of individual inlets. The bibliography was assembled and indexed to provide a basis for dialog between workers more familiar with the hydraulics and engineering literature, and those more familiar with the sedimentologic and geologic literature. The citations embraced a diverse range of subjects that are pertinent insofar as they aid comprehension of inlet-related phenomena. (Humphreys-ISWS)
W76-12999

NORTH CAROLINA MARINE ALGAE. VI. SOME CERAMIALES (RHODOPHYTA), INCLUDING A NEW SPECIES OF DIPTEROSIPHONIA,
Duke Univ., Durham, N.C. Dept. of Botany.
For primary bibliographic entry see Field 5C.
W76-13025

WATER QUALITY MODEL OF A SALT-WEDGE ESTUARY,
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 5B.
W76-13063

EPIFAUNA AT JACKSON POINT IN PORT VALDEZ, ALASKA, DECEMBER 1970 THROUGH SEPTEMBER 1972,
Geological Survey, Anchorage, Alaska.
For primary bibliographic entry see Field 5A.
W76-13070

TWO-DIMENSIONAL STEADY-STATE DISPERSION IN A SATURATED POROUS MEDIUM,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 2F.
W76-13071

A PRELIMINARY ASSESSMENT OF THE ENVIRONMENTAL VULNERABILITY OF MACHIAS BAY, MAINE TO OIL SUPERTANKERS,
Massachusetts Inst. of Tech., Cambridge.
For primary bibliographic entry see Field 6G.
W76-13087

THE POTENTIAL EFFECTS OF INCREASING OIL TANKER SIZE ON NARRAGANSETT BAY. AN ADVISORY REPORT TO THE COASTAL RESOURCES MANAGEMENT COUNCIL.
Rhode Island Statewide Planning Program, Providence.
For primary bibliographic entry see Field 6G.
W76-13088

POSSIBLE EFFECTS OF CONSTRUCTION AND OPERATION OF A SUPERTANKER TERMINAL ON THE MARINE ENVIRONMENT IN THE NEW YORK BIGHT,
State Univ. of New York at Stony Brook. Marine Sciences Research Center.
For primary bibliographic entry see Field 6G.
W76-13089

ONSHORE IMPACTS OF OIL AND GAS DEVELOPMENT IN ALASKA, VOLUME I.
Resource Planning Associates, Inc., Cambridge, Mass.
For primary bibliographic entry see Field 5G.
W76-13090

ONSHORE IMPACTS OF OIL AND GAS DEVELOPMENT IN ALASKA. VOLUME II. METHODOLOGY APPENDICES.
Resource Planning Associates, Cambridge, Mass.
For primary bibliographic entry see Field 5G.
W76-13091

THE DEVELOPMENT CRITERIA OF THE PRELIMINARY COASTAL PLAN,
University of Southern California, Los Angeles. School of Public Administration.
R. Lutz, T. Rauh, and B. J. Washom.
Available from the National Technical Information Service, Springfield, VA 22161 as COM-75-11476, $4.00 in paper copy, $3.00 in microfiche. Sea Grant Report No. USC-SG-AS1-75, August 1975. 33 p, 1 fig.

Descriptors: *Planning, *Resources development, *Environmental effects, *Management, *Water resources development, *Water management(Applied), *Land use, *Conservation, Comprehensive planning, Estimated benefits, Regional development, Coastal plains, Coastal structures, Natural resources, Water utilization, *California.
Identifiers: *Coastal zone planning(Calif).

A chart and attached text is designed for public users and developers of the California coastal zone as an easy reference and index to those policies of the Preliminary Coastal Plan which set forth criteria for development in the coastal zone. It is not intended to be used in lieu of the Plan, but rather as a guide to it. The chart is used to determine the type of development or activity involved

in the Preliminary Coastal Plan, to see what coastal resource values might be affected and to ascertain the policy intent and criteria. One hundred and eighty-two statement of policy intent are delineated. (Sinha-OEIS)
W76-13092

A WATER-QUALITY SIMULATION MODEL FOR WELL MIXED ESTUARIES AND COASTAL SEAS: VOLUME VIII, AN ENGINEERING ASSESSMENT,
Rand Corp., Santa Monica, Calif.
J. J. Leendertse, and S-K. Liu.
The New York City-Rand Institute Report No. R-1791-NYC, December 1975. 219 p, 8 ref, 10 append.

Descriptors: *Estuaries, *Coasts, *Water quality, *Hurricanes, *Engineering structures, *Barriers, *Coliforms, *Environmental effects, Bacteria, Chlorides, Dissolved oxygen, Tides, Winds.
Identifiers: Coastal zone, Simulation models, Wind direction.

An assessment of the impact on water quality of a hurricane barrier across Rockaway Inlet, Jamaica Bay, New York is presented. Two simulation models for a barrier were considered. From simulations it was concluded that: the proposed hurricane barrier plans cause slight phase retardation in the tidal propagation in the Jamaica Bay system; the plans slightly decrease the counter-clockwise net circulation of the eastern portion of the bay by approximately 3% for both plans; the prevailing wind direction substantially influences the direction of the net circulation in the northwestern portion of the bay; the barrier has an insignificant influence on wind-induced circulation; the proposed barrier plans create no significant change in the transient (short-term) dispersion and transport of pollutants such as coliform bacteria discharged in the bay; with the Water Pollution Control Facilities around Jamaica Bay operating in the upgraded mode with 90% BOD removal, the amount of reduction creates negligible stress on the oxygen distribution in this area; and the construction of the barrier will induce only insignificant changes in the chloride concentrations and distributions as well as in concentration and distributions of conservative substances discharged in the bay from the present condition. (See also W76-08317; W75-07042; W73-07935; W72-06980; and W71-04038) (Sinha-OEIS)
W76-13093

THE COASTAL PLAINS REGIONAL COMMISSION--U.S. GEOLOGICAL SURVEY. AEROMAGNETIC-AERORADIOACTIVITY SURVEY,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7B.
W76-13099

THE VIRGINIA INSTITUTE OF MARINE SCIENCE, VIRGINIA'S MARINE SCIENCE, ENGINEERING, EDUCATION, AND ADVISORY SERVICES PROGRAM,
Virginia Inst. of Marine Science, Gloucester Point.
For primary bibliographic entry see Field 6E.
W76-13100

SEAFOOD PROCESSING IN RELATION TO COASTAL INDUSTRIAL PARK CONCEPTS,
North Carolina State Univ., Raleigh. Dept. of Food Science.
For primary bibliographic entry see Field 6B.
W76-13101

WASTE DISPOSAL IN SEAFOOD PROCESSING: PUBLIC OR PRIVATE
Georgia Univ., Athens. Inst. of Natural Resources.
For primary bibliographic entry see Field 5D.
W76-13102

SHRIMP SUPPLIES IN THE SOUTHEAST AND THEIR EFFECT ON PROCESSING FIRM SIZE,
Florida Univ., Gainesville. Dept. of Food and Resource Economics.
For primary bibliographic entry see Field 6C.
W76-13103

LEGAL ASPECTS OF PUBLIC ACCESS TO BEACHES,
Hartzog, Lader, and Richards, Hilton Head Island, S.C.
For primary bibliographic entry see Field 6E.
W76-13104

BACK BAY NATIONAL WILDLIFE REFUGE. SOME PARALLELS IN IMPLEMENTING THE COASTAL ZONE MANAGEMENT ACT,
Back Bay National Wildlife Refuge, Virginia Beach, Va.
For primary bibliographic entry see Field 6E.
W76-13105

FREEING THE BEACHES: IS IT POSSIBLE,
Bureau of Outdoor Recreation, Atlanta, Ga. Southeast Regional Office.
For primary bibliographic entry see Field 6E.
W76-13106

THE ROLE OF INTERSTATE COMPACTS IN FISHERIES MANAGEMENT,
Atlantic States Marine Fisheries Commission, Washington, D.C.
For primary bibliographic entry see Field 6E.
W76-13107

STATE-FEDERAL MANAGEMENT PLANNING FOR MARINE FISHERIES: TODAY AND TOMORROW,
National Marine Fisheries Service, Washington, D.C. Fisheries Management Div.
For primary bibliographic entry see Field 6E.
W76-13108

DIATOM COMMUNITIES FROM A DELAWARE SALT MARSH,
Delaware Univ., Newark. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5C.
W76-13118

QUALITATIVE AND QUANTITATIVE SALMONELLA INVESTIGATIONS AND THEIR HYGIENIC VALUATION IN CONNECTION WITH E. COLI TITRE, DEMONSTRATED WITH EXAMPLES FROM THE COASTAL WATERS OF KIEL BIGHT (WESTERN BALTIC SEA), (IN GERMAN),
Kiel Univ. (West Germany). Hygiene Institut.
For primary bibliographic entry see Field 5A.
W76-13140

DESIGNING REGIONALIZED WASTE WATER TREATMENT SYSTEMS,
Ohio State Univ., Columbus. Department of Civil Engineering.
For primary bibliographic entry see Field 5D.
W76-13166

AN ERTS-1 STUDY OF COASTAL FEATURES ON THE NORTH CAROLINA COAST,
Coastal Engineering Research Center, Fort Belvoir, Va.
For primary bibliographic entry see Field 7B.
W76-13174

TECHNIQUES IN EVALUATING SUITABILIT OF BORROW MATERIAL FOR BEAC NOURISHMENT,
Coastal Engineering Research Center, Fo Belvoir, Va.
For primary bibliographic entry see Field 8B.
W76-13175

STOCHASTIC SEA STATE FOR SRB STUDIES
Northrop Services, Inc., Huntsville, Ala.
M. Perlmutter, and M. E. Graves.
Report No. NASA CR-2649, February 1976. 46 7 fig, 6 tab, 12 ref. NASA NAS8-21810.

Descriptors: *Model studies, *Ocean wave *Winds, Waves(Water), Stochastic process Monte Carlo method, Mathematical mode Ocean currents, Oceanography, Equations, Sim lation analysis, Graphical analysis.
Identifiers: *Ocean wave models, Wave heigh Solid rocket booster, Wave slopes.

Ocean surface characteristics at two locatio were studied for a Space Shuttle solid roc booster ocean impact and recovery analys Probability distributions of wave heights, wa slopes, wave velocities, ocean currents, and kilometer altitude winds were formulate Procedures for generating ocean wave simulatio were also described. (Sims-ISWS)
W76-13177

THE FEASIBILITY OF OIL-POLLUTION D TECTION AND MONITORING FROM SPAC EXAMPLES USING ERTS-1 AND SKYL DATA,
Environmental Research Inst., of Michigan, A Arbor. Infrared and Optics Div.
For primary bibliographic entry see Field 5A.
W76-13181

BASIC INVESTIGATIONS FOR REMOT SENSING OF COASTAL AREAS,
Environmental Research Inst. of Michigan, A Arbor. Resources and Technology Div.
R. A. Shuchman, C. T. Wezernak, D. R. Lyzenga and F. J. Thomson.
Available from the National Technical Inform tion Service, Springfield, VA 22161 as AD-A0 959, $4.00 in paper copy, $3.00 in microfich Quarterly Report 108900-4-L, October 1975. 33 8 fig, 20 ref, append. ONR N00014-74-C-0273.

Descriptors: *Beaches, *Coasts, *Remo sensing, Microwaves, Radar, Sands, Moistu content, Particle size, Reflectance, Samplin Shallow water, Shores, Model studies, Mathema cal studies, Air-water interfaces, Laboratory test On-site investigations.

A program in coastal dynamics has be developed to determine which beach a nearshore features are of interest to t researchers active in the coastal dynamic pr grams and to determine the extent to which the features can be mapped by remote sensi systems. Progress to date in using processi techniques to extract coastal bottom informa'i from passive multispectral scanner (MSS) da was presented in the July 15 through October 1 1975 quarterly report. A summary was presente on development of a reflectance model used to o tain information on coastal bottom composition Progress in the beach environment task was r ported. During the reporting period the lab anal sis on the thirty new beach samples was complet and the results loaded into a computer file f statistical analysis. The radar study is near completed. This task is a small effort of the tot program and deals with the problem of rock beach recognition. Various existing theories f equating radar backscatter to terrain roughne were explored. The strengths and shortcomings the various theories were studied. (Sims-ISWS)
W76-13182

LIBRARY U. OF I. URBANA-CHAMPAIGN

C INVESTIGATIONS FOR REMOTE
ING OF COASTAL AREAS,
onmental Research Inst. of Michigan, Ann
. Resources and Technology Div.
Shuchman, C. T. Wezernak, D. R. Lyzenga,
u, and F. J. Thomson.
able from the National Technical Informa-
ervice, Springfield, VA 22161 as AD-A017
$4.50 in paper copy, $3.00 in microfiche.
erly Report 108900-3-L, July 1975. 53 p, 15
ref. ONR N00014-74-C-0273.

iptors: *Beaches, *Coasts, *Remote
g, Microwaves, Radar, Sands, Moisture
t, Particle size, Reflectance, Sampling,
w water, Shores, Model studies, Mathemati-
dies, Air-water interfaces, Laboratory tests,
e investigations.

ogram in coastal dynamics has been
ped to determine which beach and
ore features are of interest to the
chers active in the coastal dynamic program
determine the extent to which these fea-
can be mapped by remote sensing systems.
ss to date in using processing techniques to
t bottom information from passive mul-
ral scanner (MSS) data was presented in the
5 through July 15, 1975 quarterly report. A
theoretical consideration was included
ing the rationale for use of a minimum 2-
el 'modified' ratio method to obtain informa-
out bottom compositions. While progress in
ach environment task during this reporting
consisted primarily of lab work (i.e.,
ing samples for reflectance measurements
taining geologic information about samples)
ical evidence was presented that justifies
annels chosen to diagnose grain size and
re content of the first year's twenty sam-
he radar study task is a small effort of the
ogram. It deals with the problem of rocky
recognition. This task demonstrates the
al usefulness of multichannel imaging radar
l information where the beach environment
e., passive MSS) has its upward bounds, the
grain size. A short description using data
two-wavelength radar was given demon-
radar's utility in determining rock size.
SWS)
183

CATIONS OF REMOTE SENSING TO
RINE PROBLEMS,
a Inst. of Marine Science, Gloucester Point.
unday, Jr, R. J. Byrne, C. S. Welch, H. H.
, and J. D. Boon, III.
le from the National Technical Informa-
vice, Springfield, VA 22161 as N76-15526,
paper copy, $3.00 in microfiche. Annual
No. 3, December 1975. 168 p, 38 fig, 13 tab,
append. NASA-NGL 47-022-005.

tors: *Remote sensing, *Aerial photog-
*Buoys, *Dye releases, *Virginia,
peake Bay, Circulation, Water circulation,
Estuaries, Shores, Pollution, Sewage ef-
Dredging, Oil pollution, Water quality,
persion, Tides, Tidal waters, Coasts.
ers: Dye buoys.

y of siting problems for the estuaries of
er Chesapeake Bay have been solved with
neficial remote sensing techniques. Prin-
chniques used were repetitive 1:30,000
otography of dye-emitting buoys to map
on patterns, and investigation of water
oundaries via color and color infrared
to scales of 1:120,000. Problems solved in-
ewage outfall siting, shoreline preserva-
enhancement, oil pollution risk assess-
d protection of shellfish beds from dredge
ns. (Sims-ISWS)
84

CONCENTRATIONS OF MERCURY, CADMIUM, LEAD AND COPPER IN THE SURROUNDING SEAWATER AND IN SEAWEEDS, UNDARIA PINNATIFIDA AND SARGASSUM FULVELLUM, FROM SUYEONG BAY IN PUSAN, (IN KOREAN),
Pusan Fisheries Coll. (Republic of Korea).
For primary bibliographic entry see Field 5A.
W76-13190

CONTENT OF SOME TRACE ELEMENTS IN MACROPHYTES OF THE VOLGA DELTA, (IN RUSSIAN),
Kaspiiskii Nauchno-Issledovatelskii Institut Rybnogo Khozyaistva, Astrakhan (USSR).
For primary bibliographic entry see Field 5A.
W76-13194

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

THE IMPACT OF INCREASED FUEL COSTS AND INFLATION ON THE COST OF DESALTING SEA WATER AND BRACKISH WATERS,
Oak Ridge National Lab., Tenn.
S. A. Reed.
Report ORNL-TM-5070, December 1975, 25 p, 6 fig, 1 tab, append. W-7405-Eng-26.

Descriptors: *Desalination, *Costs, Desalination plants, Desalination processes, Cost analysis, Brackish water, Waste water treatment, Capital costs.

The rapid increase in the price of fuels and the escalation in all capital cost areas along with high interest rates during the last 3 to 5 years have had a marked impact on the cost of desalting saline waters. For 100 Mgd plant sizes, distillation plant capital costs have risen from $1 per daily gallon to $3 per daily gallon and for plant sizes of 5 Mgd or less from $1.40 per daily gallon to about $5 per daily gallon. Similarly, the costs for desalting brackish waters via electrodialysis, reverse osmosis, or ion exchange have increased significantly. The report presents the results of a parametric study to estimate the current costs of desalting sea water and brackish waters as a function of plant size and feed water chemistry. (Chilton-ORNL)
W76-12778

HYGIENIC EVALUATION OF THE QUALITY OF WATER DESALINATED IN INDUSTRIAL ELECTRODIALYSIS INSTALLATIONS UNDER CONDITIONS OF COUNTRY SETTLEMENTS, (IN RUSSIAN),
Meditsinskii Institut Saratov (USSR).
For primary bibliographic entry see Field 5F.
W76-12910

THE ROLE OF DESALTING AND BRACKISH WATER RESOURCES IN THE ARID REGIONS OF THE AMERICAS,
Massachusetts Inst. of Tech., Cambridge. Dept. of Mechanical Engineering.
R. F. Probstein, and J. M. Alvarez.
Interciencia, Vol 1, No 1, p 17-23, May-June 1976. 6 fig, 20 ref.

Descriptors: *Desalination, *Desalination processes, *Brackish water, *Water resources development, *Water management(Applied), Arid lands, *Mexico, Reverse osmosis, Ion exchange, Electrodialysis, Economic feasibility, Planning, *South America, *United States, Waste water treatment.

Economic and technological limitations of desalination for arid land development are mostly surmounted by use of brackish waters (i.e., those having a dissolved salt or solids content less than 15% of salt water). Various desalting techniques appropriate for brackish water purification are described, including the newer membrane and adsorption methods (reverse osmosis, electrodialysis and ion exchange). Such purification can be done at a moderate cost, is useful for a wide range of capacities and is simple enough to be viable under various arid conditions. Location and quality of brackish surface and ground waters are described using maps of the United States, Mexico and South America. Suggested development of these resources is outlined for Latin America; priorities include mapping of brackish water resources in the arid regions, establishment of regional desalting test stations and advanced research and development programs. A comprehensive and systematic approach is emphasized. (Jahns-Arizona)
W76-13133

SEA WATER DESALINATION APPARATUS,
Snam Progetti S.p.A., Milan (Italy). (Assignee).
G. Pagani.
U. S. Patent No. 3,961,658, 4 p, 5 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 947, No 2, p 624, June 8, 1976.

Descriptors: *Patents, *Desalination, *Water purification, *Water quality control, Sea water, Distilation, Long-tube vertical distillation, Desalination apparatus, Evaporators, Condensers.
Identifiers: Multiple-effect distillation.

An apparatus for the desalination of sea water is comprised of a column of a number of superposed cylindrical sections. Each section includes two film evaporators, two basins, interconneced between the cylindrical sections, a restriction for passing brine from basin to basin, siphon tubes for withdrawing the condensed water from each section and accessory preheating means and inlet and outlet tubes. This invention is a multiple-effect distillation process based on the principle of evaporation and succeeding condensation. The vapor produced in one stage is permitted to condense in the following stage for producing vapor at a lower thermal level and so on for all the other stages. (Sinha-OEIS)
W76-13136

NOVEL POLYMER MEMBRANES FOR REVERSE OSMOSIS,
Babcock and Wilcox ltd., London (England). (Assignee).
For primary bibliographic entry see Field 5F.
W76-13153

APPARATUS FOR THE PREVENTION OF SCALING IN DESALINATION APPARATUS,
Commissariat a l'Energie Atomique, Paris (France); and Compagnie des Salins du Midi et des Salines de l'Est, Paris (France). (Assignee).
A. Cailaud, P. Charuit, C. Daffau, and J. Ravoire.
U. S. Patent No. 3,963,619, 5 p, 4 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 947, No 3, p 1264, June 15, 1976.

Descriptors: *Patents, *Desalination, *Water purification, *Water treatment, *Desalination apparatus, *Scaling, Sea water, Potable water.
Identifiers: Seed crystals.

Apparatus for producing fresh water from sea water or briny water which operates on the evaporation-distillation principle has a limited capacity owing to upper temperature and operating limits imposed by scaling. This invention relates to a device of simple design for decanting crude sea water solutions containing the scaling salts and which lends itself to use in combination with conventional apparatus used in desalination processes. An apparatus for separating solids from a liquid suspension using an evaporator/decanter has an outer and inner vessel and an inverted fun-

nel member housed within the inner vessel, the leg of the funnel extending through the top of the inner vessel. A gutter member, mounted around the inner circumference of the inner vessel collects the clarified water. In a process for removing scaling agents from sea water, seed crystals are added to the sea water which is then heated to a temperature above the solubility limits of the scaling agents and above the operating temperatures of a desalination unit to cause the scaling agent to crystallize on the seed crystals. The seed crystal solution is then fed into the outer vessel of the apparatus to effect removal of the crystals and produce a clarified sea water feed for the desalination unit. (Sinha-OEIS)
W76-13154

3B. Water Yield Improvement

A SUMMARY OF THE GROUND-WATER HYDROLOGY OF THE AREA BETWEEN THE LAS VEGAS VALLEY AND THE AMARGOSA DESERT, NEVADA, WITH SPECIAL REFERENCE TO THE EFFECTS OF POSSIBLE NEW WITHDRAWALS OF GROUND WATER,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 4B.
W76-12807

FLOODWATER RETARDING STRUCTURE YIELD IMPACT,
Agricultural Research Service, Chickasha, Okla. Southern Plains Branch.
For primary bibliographic entry see Field 4A.
W76-12978

A SECOND LOCALITY FOR NATIVE CALIFORNIA FAN PALMS (WASHINGTONIA FILIFERS) IN ARIZONA,
Geological Survey, Tucson, Ariz.
For primary bibliographic entry see Field 2I.
W76-13069

STUDIES ON NUMERICAL MODELLING AND MODIFICATION OF CYCLONE SCALE PRECIPITATION,
Michigan Univ., Ann Arbor. Dept. of Atmospheric and Oceanic Science.
F. Baer, D. B. Rao, and D. Boudra.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A022 470, $4.50 in paper copy, $3.00 in microfiche. Final Report, January 1976. 62 p, 11 fig, 4 tab, 26 ref, 2 append. ARO DAHC04-73-C-0001.

Descriptors: *Model studies, *Precipitation(Atmospheric), *Forecasting, *Weather modification, Mathematical models, Rainfall, Atmosphere, Atmospheric physics, Cloud physics, Cloud seeding, Finite element analysis, Condensation, Meteorology.

A fine-mesh limited area model was developed both to predict precipitation over a limited geographic region, and to be utilized in experiments with precipitation modification. The model utilized the primitive equations, incorporated fifteen levels in the vertical, and had a basic grid length of 80 km. It showed many of the features of current models of its type, but lacked resolution in the boundary layer. Lateral boundary conditions were specified when needed from a data set which also provided initial conditions and comparisons for the forecasts. Finite-difference integrations were performed but spectral techniques were studied. Forecasts with the model showed some fidelity to observations but some short-comings also. Setting one integration as a control, a number of experiments were performed with model modifications and compared to the control. In all cases, modification did not substantially alter the flow field over a 24 hour period. Precipitation forecasts were altered however. By reducing condensation related to cloud top temperature, implying lack of freezing nuclei, regions of marginal precipitation showed almost no precipitation. With enhanced condensation based on cloud seeding, these regions showed significant increase in precipitation. The addition of carbon black to the model for heating did not show substantial changes in precipitation. Modified initial conditions based on poor (coarse grid) resolution has a significant effect on precipitation predictions. (Sims-ISWS)
W76-13185

3C. Use Of Water Of Impaired Quality

THE VEGETATION OF DUNE SLACKS AT NEWBOROUGH WARREN: III. PLANTAGO CORONOPUS,
Nigeria Univ., Nsukka. Dept. of Botany.
S. S. C. Onyekwelu.
J Ecol. 60(3), p 907-916, 1972.

Descriptors: *Vegetation, *Phosphorus, *Nitrogen, *Germination, Dunes, Topography, Ecology, Sea water, Salts.
Identifiers: *Plantago-Coronopus, *Wales, *Dune slacks.

Some aspects of the autecology of P. coronopus were studied (at Anglesey, Wales) by pattern analysis technique and experiment. The scale of pattern exhibited was related to microtopography. Experimental studies show a better performance at lower water tables. The poor performance in the dune slacks is attributed to low N and P status. Germination is retarded in the dark and with increase in soil depth. There is no effect on germination when the seeds are chilled, and though there is no germination in 50% sea water, the high salt content shows no considerable injury to the seeds. There is no fall of viability with storage.--Copyright 1973, Biological Abstracts, Inc.
W76-12911

PLANNING FOR WATER RECREATION IN ISRAEL,
Technion-Israel Inst., of Tech., Haifa. Center for Urban and Regional Studies.
For primary bibliographic entry see Field 6B.
W76-12959

IRRIGATION REUSE SYSTEMS--A PROPOSED NEW ASAE ENGINEERING PRACTICE,
Colorado State Univ., Fort Collins. Dept. of Agricultural.
W. E. Hart.
Presented at the 1975 Winter Meeting of the American Society of Agricultural Engineers, December 15-18, 1975, Chicago, Illinois. 24 p, 4 fig, 1 tab, 30 ref. ASAE Paper 75-2542.

Descriptors: *Irrigation systems, *Irrigation practices, *Irrigation design, *Irrigation engineering, Irrigation water, Irrigation, Agriculture, Furrow irrigation, Surface irrigation, Publications, Water reuse.
Identifiers: *Reuse systems(Irrigation).

A subcommittee of the Surface Irrigation Technical Committee (SW-242) has prepared a draft document which will be submitted for consideration as an ASAE Engineering Practice. This document, has six sections--purpose and scope, definitions, system analysis, determination of runoff, system design, and costs. (Skogerboe-Colorado-State)
W76-13016

WATER ECONOMY AND DRINKING REGIME OF THE BEDOUIN GOAT,
Tel-Aviv Univ. (Israel). Dept. of Zoology.
A. Shkolnik, A. Borut, I. Choshniak, and A. Maltz.
In: Symposium Israel-France, Ecolo
Research on Development of Arid Z
(Mediterranean Deserts) with Winter Preci
tion. Special Publication 39, Department of S
tific Publications, Volcani Center, Bet Da
Israel, p. 79 - 90, 1975. 5 fig, 2 tab, 11 ref.

Descriptors: *Goats, *Xerophilic animals, *W
requirements, Animal metabolism, Adapta
Moisture stress, Carrying capacity, An
physiology, Water balance.
Identifiers: *Bedouin goats.

Black Bedouin goats are the only domestic r
nants except camels which thrive in desert a
water is normally given to them every 2 to 4 d
even in summer. They have withstood long pe
of deprivation under experimental conditions
degrees C and 30% relative humidity while m
taining their appetite. Their resistance to dehy
tion may be due to a high body water co
enhanced by a low rate of water exchange wit
environment. After deprivation, these goats
replenish their body water content by drin
volumes of water exceeding 40% of body we
Field studies on a desert herd confirmed
general adaptive pattern noted in the labora
Compared with sheep and another local
breed, the Bedouin goat had superior efficien
exploiting the meager desert pasture where w
sources were widely spaced. Lactating goats
an even higher body water content than nonla
ing ones. High milk production is maintained
ing periods of water shortage. The Bedouin
has a low metabolic rate and consumes about
third the caloric intake of the mountain
(Jahns-Arizona)
W76-13125

**ASPECTS OF SOIL SALINITY AND SODIC
IN RELATION TO IRRIGATION AND REC
MATION,**
Volcani Inst. of Agricultural Research, Bet-D
(Israel). Dept. of Soil and Water.
J. Shalhevet.
In: Symposium Israel-France: Ecolo
Research on Development of Arid Z
(Mediterranean Deserts) with Winter Preci
tion. Special Publication 39, Department of S
tific Publications, Volcani Center, Bet Da
Israel, p. 117-140, 1975. 14 fig, 54 ref.

Descriptors: *Saline soils, *Land reclama
*Encroachment, *Irrigation effects, *Alk
soils, Sodium, Soil physical properties,
chemistry, Irrigation water, Leaching,
dynamics, Subsurface drainage, Carbonates.
Identifiers: Equivalent dilution principle.

The rate of soil salt accumulation depends m
on the amount of salt entering with irrigation w
and the quantity of water used in excess of
needed for plants. This paper discusses that
tionship as modified by soil chemical and phy
properties and crop growth. Also described a
rigation practices influencing salt accumula
patterns in time and space in relation to
response. Leaching usually eliminates soil salt
cumulated through geologic processes or hu
intervention. Soil salt movement is controlled
gely by convective water flow and diffusion.
ple models for the prediction of salt leaching
outlined, along with the influences of water
rate, moisture content and the necessity of a
cial subsurface drainage. Sodicity may dev
after leaching, or the soil may initially conta
high relative sodium concentration. A high so
concentration causes structural breakdown
reduced permeability, depending on total
trolyte concentration and soil characteristics.
carbonate concentration may aggravate the co
tion. Sodic soil reclamation using amendmen
discussed, along with the use of the equiva
dilution principle. (Jahns-Arizona)
W76-13126

NED IRRIGATION AND FERTILIZA-
OF TOMATOES GROWN ON SAND

Inst. of Agricultural Research, Bet-Dagan
Div. of Soil Chemistry and Plant Nutri-

, J. Ben Asher, B. Bar Yosef, U. Kafkafi,
Goldberg.
ymposium Israel-France: Ecological
h on Development of Arid Zones
ranean Deserts) with Winter Precipita-
ecial Publication 39, Department of Scien-
blications, Volcani Center, Bet Dagan,
. 141-146, 1975. 4 tab, 5 ref.

ors: *Irrigation efficiency, *Nutrient
ients, *Fertilization, *Water require-
*Tomatoes, *Dunes, Irrigation effects,
er-plant relationships, Crop production,
r irrigation, Phosphorus, Sierozems, Soil
Root development.
rs: *Trickle irrigation.

lge of plant nutrition and irrigation was
o an experiment in which tomatoes were
n sand dunes using minimal water and
. The best yield was obtained using a
rtilizer with N, P and K supplied daily
kle irrigation. This treatment had the
dry matter production and highest N, P
ptake. Water and nutrient concentrations
l profile, root penetration and nutrient up-
discussed for this and two other treat-
roadcast and disced superphosphate was
d from the 0-20 cm layer with sprinkler ir-
46 days after seeding, while its concentra-
ne soil was greatly reduced at the end of
ing period. When phosphorus was not
with trickle irrigation, the soil P was
way and concentrated at 30 cm from the
er 46 days. Only a continuous supply of P
kling water caused P concentration near
to be higher than that at a distance and
gher near the stem to the end of the grow-
d. Trickle irrigation caused a concentra-
ots near the stem. Determination of vari-
rs relating to effective fertilization and ir-
s described. (Jahns-Arizona)
27

nservation In Domestic and
icipal Use

LOGIC DATA FOR URBAN STUDIES
DALLAS, TEXAS METROPOLITAN
074,
l Survey, Austin, Tex.
ry bibliographic entry see Field 7C.
4

MARY OF THE GROUND-WATER
OGY OF THE AREA BETWEEN THE
GAS VALLEY AND THE AMARGOSA
NEVADA, WITH SPECIAL
NCE TO THE EFFECTS OF POSSIBLE
THDRAWALS OF GROUND WATER,
l Survey, Reston, Va.
ry bibliographic entry see Field 4B.
7

TION OF THE REPORT ON INTER-
SEWERS AND SUBURBAN SPRAWL.
ental Protection Agency, Washington,
e of Planning and Evaluation.
ry bibliographic entry see Field 5D.
5

FALLS IMIS PROJECT. WATER
PROCESSING SYSTEM APPLICA-
LUATION REPORT,
niv., Lawrence. Inst. for Social and En-
al Studies.
rds, and J. Zelinka.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-249 827, $5.50 in paper copy, $3.00 in microfiche. Report USAC-WFT 2-5016, Prepared for the Department of Housing and Urban Development, April 1975. 113 p, 1 fig, 66 tab, 5 append. H-1217.

Descriptors: *Evaluation, *Information exchange, *Management, *Accounting, Finance, Cities, Cost-benefit analysis, Cost analysis, *Texas.
Identifiers: *Integrated Municipal Information System(IMIS), *Urban Systems Advisory Committee(USAC), *Water Utility Processing System(WUPS), *Wichita Falls(TX), Municipal information systems.

The specific Integrated Municipal Information System (IMIS) project in Wichita Falls was the Water Utility Processing System (WUPS) operating in the Utility Collections Department concerned with meter reading, service change order processing, cash collection and customer servicing, accounts reporting, accounts auditing and ledger 'A' accounts processing. Impacts of implementation were evaluated in regard to manpower cost, efficiency and function; users of the system; and other municipal activities. Installation of WUPS caused: (1) initial disruption of service as personnel learned the automated system; (2) slight savings in labor and manpower costs; (3) more accessible and reliable financial and non-financial information; (4) increased integration of official city and private business operations due to this previously unwieldy data base; (5) increased analytical capacity encouraging more accurate and efficient municipal activities. Long run efficiencies occurred in meter reading which was simplified and streamlined by automatic routing and continuous development of contiguous books; data entry and retrieval; information processing where billing and information storage errors are reduced; and data analysis is facilitated by extensive and current reports and lists. (Gentry-North Carolina)
W76-13040

URBAN HYDROLOGY FOR SMALL WATERSHEDS.
Soil Conservation Service, Washington, D. C. Engineering Div.
For primary bibliographic entry see Field 4C.
W76-13044

MORE WATER: ONE CITY'S PLAN,
Henningson, Durham and Richardson, Inc., Henderson, Tex.
For primary bibliographic entry see Field 6D.
W76-13097

3E. Conservation In Industry

WATER FOR INDUSTRIAL AND AGRICULTURAL DEVELOPMENT IN COAHOMA, DE SOTO, PANOLA, QUITMAN, TATE, AND TUNICA COUNTIES, MISSISSIPPI,
Geological Survey, Jackson, Miss.
G. J. Dalsin, and J. M. Bettandorff.
Mississippi Research and Development Center, Jackson, Miss., 1976. 87 p, 27 fig, 16 tab, 39 ref, append.

Descriptors: *Water resources development, *Industrial water, *Agriculture, *Mississippi, *Hydrologic data, Water utilization, Surface waters, Groundwater, Streamflow, Aquifer characteristics, Water yield, Water wells, Hydrogeology, Water quality, *Water supply, Available water, Projections, Surface-groundwater relationships.
Identifiers: Northwest Mississippi.

Ground water is the major source of industrial and agricultural water supplies in Coahoma, De Soto, Panola, Quitman, Tate, and Tunica Counties, Miss. 33 million gallons per day (mgd) were used for public and industrial supply in 1973; irrigation use for the year was 39,000 acre-feet. Average runoff contributed to river basins in the study area is 2,600 mgd. The average flow of the Mississippi River is 297 billion gallons per day. Sardis, Enid, and Arkabutla Lakes have a combined conservation storage of 197,000 acre-feet and can hold more than 2.5 million acre-feet. The fresh-groundwater section is 800 to 3,000 feet thick. Tertiary aquifers, the major source of public, industrial, and domestic water supplies, are capable of supplying 1 million gallons of water per day or more to well fields in most places. The Mississippi River valley alluvial aquifer supplies water for irrigation, cooling, and industrial uses. Well fields can supply several million gallons per day. Ground water is highly mineralized in downdip areas of the Tertiary aquifers. Iron and low pH cause problems locally in water supplies. Water in the Mississippi River valley alluvial aquifer is hard and contains excessive iron. (Woodard-USGS)
W76-12798

A PLAN FOR STUDY OF WATER AND ITS RELATION TO ECONOMIC DEVELOPMENT IN THE GREEN RIVER AND GREAT DIVIDE BASINS IN WYOMING,
Geological Survey, Cheyenne, Wyo.
For primary bibliographic entry see Field 6D.
W76-12805

CONSERVATION: EESG BIBLIOGRAPHY SERIES:16,
Reading Univ. (England). Dept. of Economics.
For primary bibliographic entry see Field 6B.
W76-12953

WATER REQUIRED TO DEVELOP GEOTHERMAL ENERGY,
Texas University at Austin. Geothermal Studies.
M. H. Dorfman.
American Water Works Association Journal, Vol. 68, No. 7, p 370-374, July 1976. 7 fig, 22 ref.

Descriptors: *Geothermal studies, *Temperature, *Thermal properties, Environmental effects, Brines, Boron, Potash, Lithium, Land subsidence, Potable water, Geysers, Hot springs, Steam, Subsurface waters, Drilling equipment, Drilling fluids, California, *Energy.
Identifiers: Vapor-dominated connective systems, Liquid-dominated connective systems, High-enthalpy brines, Low-enthalpy fluids, Geopressured sands, Continental plates, Plate tectonics, Subduction zones, Crustal spreading, Italy, Mexico.

World wide distribution of geothermal resources may be identified within the framework of geologic mode of occurrence. Vapor-dominated connective systems are found in areas of plate convergence. Liquid-dominated connective systems, made up of high-enthalpy brines, are found in areas of crustal spreading. Low-enthalpy fluids are found at moderate to great depths in geopressured sands in subsiding sedimentary basins. Water needs for development of geothermal resources are minimal and are usually available. Water production presents varied problems however, depending upon the type of geothermal system. Vapor systems are sulfur rich and require protection against corrosion. Hot brines found in liquid systems are chlorine rich and require scaling and corrosion protection. Large-scale geothermal development may lead to development of mineral-extraction industries. Vapor system fluids are often rich in boron compounds and liquid system brines contain potash, lithium and other useful minerals. Potable water for irrigation may become an important by-product geothermal energy development. Subsidence problems from geothermal fluids will require additional research to determine the extent of the problem and develop methods of mitigating its effects. Geothermal areas appear to represent a useful source of energy

with worldwide distribution. It is anticipated that geothermal energy will represent an increasing fraction of total energy supply as petroleum availability diminishes. (Heiss-NWWA)
W76-13030

ENVIRONMENTAL CONTROL IN PLANTS AT MINIMUM COST,
For primary bibliographic entry see Field 5D.
W76-13056

SHRIMP SUPPLIES IN THE SOUTHEAST AND THEIR EFFECT ON PROCESSING FIRM SIZE,
Florida Univ., Gainesville. Dept. of Food and Resource Economics.
For primary bibliographic entry see Field 6C.
W76-13103

3F. Conservation In Agriculture

EFFECTIVENESS OF INORGANIC FERTILIZERS IN RESTORING FERTILITY OF IRRIGATION-ERODED SOILS, (IN RUSSIAN),
Uzbekskii Gosudarstvennyi Universitet, Samarkand (USSR).
K. K. Khamdamov, and I. Berdikulov.
Dokl Vses (Ordena Lenina) Akad S-KH Nauk Im V I Lenina. 4, p 13-14, 1974.

Descriptors: *Fertilizers, *Inorganic compounds, *Soil erosion, *Crop production, Irrigation, Nutrients.
Identifiers: Millet.

Application of inorganic fertilizers increases the crop-producing ability of these soils. The vegetative mass of millet and its root weight do not directly correlate with its yield. This was attributed to changes in the content of soil nutrients and physical properties of eroded and uneroded soils.--Copyright 1975, Biological Abstracts, Inc.
W76-12785

WATER FOR INDUSTRIAL AND AGRICULTURAL DEVELOPMENT IN COAHOMA, DE SOTO, PANOLA, QUITMAN, TATE, AND TUNICA COUNTIES, MISSISSIPPI,
Geological Survey, Jackson, Miss.
For primary bibliographic entry see Field 3E.
W76-12798

INVESTIGATIONS ON THE WATER REGIME OF THE MAIN SOIL TYPES OF THE CRIS RIVER PLAIN, (IN ROMANIAN),
Institutul de Studii si Cercetari Pedologie, Bucharest (Rumania).
For primary bibliographic entry see Field 2G.
W76-12856

SOME HISTORICAL DATA ON THE ANTIQUITY OF SOIL IRRIGATION IN THE AZERBAIJAN SSR, (IN RUSSIAN),
Sh. G. Gasanov.
Izv Akad Nauk Az SSR Ser Biol Nauk. 5-6, p 63-68, 1974.

Descriptors: *Irrigation practices, *History, Irrigation ditches, Irrigation canals.
Identifiers: Azerbaijan-SSR, USSR.

The Azerbaidzhan-SSR (USSR) is a land of ancient agriculture where, by means of a system of canals, irrigation ditches and tunnels, the soils of the lowland and plain regions have been irrigated since 1500 B.C. Data on the history of irrigation and development of soils for irrigated crops in Azerbaidzhan are presented.--Copyright 1976, Biological Abstracts, Inc.
W76-12917

EFFICIENCY OF NITROGEN, CARBON, AND PHOSPHORUS RETENTION BY SMALL AGRICULTURAL RESERVOIRS,
Agricultural Research Service, Oxford, Miss. Sedimentation Lab.
For primary bibliographic entry see Field 4D.
W76-12983

SEDIMENT FROM DRAINAGE SYSTEMS FOR A HEAVY SOIL,
Ohio State Univ., Columbus. Dept. of Agricultural Engineering.
G. O. Schwab, B. H. Nolte, and R. D. Brehm.
Presented at the 1975 Winter Meeting of the American Society of Agricultural Engineers, December 15-18, 1975, Chicago, Illinois. 7 p, 3 fig, 2 tab, 10 ref. ASAE Paper 75-2549

Descriptors: *Sediment discharge, *Sediment load, *Sediment transport, *Sediment yield, *Drainage, Drainage practices, *Drainage systems, Drains, Ohio, Tile drains, Soils.

Sediment losses from tile and surface drainage systems in a lakebed soil in northern Ohio were measured for 6 years (1969-74). Average annual losses were 2369 Kgs/Ha from tile only and 3710 Kgs/Ha for surface only. Expected losses for the combination tile and surface drainage system were 3260 Kgs/Ha. Losses ranged from about 200 to 900 Kgs/Ha annually. Average net losses from sprinkler irrigation were negligible and usualy more sediment was added than removed in the drainage water. Sediment concentration in tile flow from irrigation increased significantly with the antecedent soil moisture content. Concentrations were high at the beginning of flow but decreased to a nearly constant level after 20 hours. A possible explanation for the high concentrations is that the sediment moved in suspension with the water and not through the soil cracks. The total estimated soil loss from the surface drained only plots was within one percent of the measured losses. The estimated losses were computed from the universal soil loss equation. For the no-till plots the estimated losses were 16 percent higher than than the measured whereas conventional tillage losses were 11 percent lower. A linear regression was significant at the 99% level. EStimates using ant runoff factor rather than the rainfall factor in the soil loss equation were 41 percent of the measured values compared to 89 percent using the rainfall factor. (Skogerboe-Colorado State)
W76-13001

IRRIGATION SCHEDULING AND SUGARBEET PRODUCTION,
Northern Ohio Sugar Co., Fremont, Ohio.
G. D. Jardine, and S. D. Fox.
Presented at the 1975 Winter Meeting of the American Society of Agricultural Engineers, December 15-19, 1975, Chicago, Illinois. 6 p, 4 tab, 6 ref. ASAE Paper 75-2556.

Descriptors: *Sugarbeets, Irrigation, Irrigation practices, Crop response, Colorado, Soil moisture, Irrigation efficiency, *Scheduling, Crop production.
Identifiers: *Irrigation scheduling.

Irrigation scheduling and sugarbeet production are discussed. The emphasis is upon the results of Great Western Sugar Company's irrigation studies and the recommendations for a successful sugarbeet irrigation program. Recommendations are: (1) begin the season with a full or nearly full soil moisture profile; (2) give the crop a boost with light irrigations for emergence and after thinning, if necessary; (3) schedule irrigations throughout the season using climate, crop, and soil data. Also, include the irrigators experience and habits where possible in determining the actual schedule; and (4) utilize irrigation scheduling to determine the cut-off dates for late season irrigations. These recommendations all point toward managing the soil moisture so the maximum sugar production can be attained by utilizing all the resources ava ble to the grower. Today's sugarbeet grower n be a good manager. All tools researchers can p vide to better manage irrigations will help in the continued production of high yielding, h quality, sugarbeets. (Skogerboe-Colorado Stat W76-13002

TRICKLE AND SPRINKLER IRRIGATION GRAIN SORGHUM,
Texas A and M Univ., College Station. Dep Agricultural Engineering.
C. J. Ravelo, E. A. Hiler, and T. A. Howell.
Presented at the 1975 Winter Meeting of the A ican Society of the Agricultural Engine December 15-18, 1975, Chicago, Illinois. 17 fig, 3 tab, 15 ref. ASAE Paper 75-2574.

Descriptors: *Crop response, *Sorgh *Irrigation practices, *Irrigation effe *Sprinkler irrigation, Irrigation systems, *C sorghum.
Identifiers: *Drip irrigation, *Trickle irrigatio rigation frequency.

The crop response and water use efficiency (of weight of grain harvested to centimeters of crop water use) of grain sorghum was investig using trickle and sprinkler irrigation. Also th fects of different trickle irrigation frequencie the crop growth and ultimate grain yield were died. Two different experimental investigat are reported one conducted in 1972 and anoth 1974. The 1972 sprinkler vs. trickle experimen the following two irrigation treatments with t replications each: (1) trickle irrigated three t per week, and (2) overhead sprinkler irri three times per week. The irrigation amoun each treatment were 1.1 times soil water loss measured by the neutron method with gravim sampling in the upper 10 cm. The 1974 trick rigation frequency experiment had the follo three treatments with three replications each trickle irrigated thrice weekly, (2) trickle irri twice weekly, and (3) trickle irrigated weekly. From the results of these experiment vestigations and for the given conditions of study, the following conclusions can be drawn There were no significant differences in yie water use efficiency when using trickle and s kler irrigation with a thrice-weekly frequency (2) Different trickle irrigation frequencies (twice, and thrice weekly) with the same overa plication amounts had no significant effec grain sorghum yield or water use efficie (Skogerboe-Colorado State).
W76-13003

SPRINKLER EVAPORATION LOSSES IN SOUTHERN PLAINS,
Southwestern Great Plains Research Ce Bushland, Tex.
R. N. Clark, and W. W. Finley.
Presented at the 1975 Winter Meeting of the A ican Society of Agricultural Engineers, Dece 15-18, 1975, Chicago, Illinois, 11 p, 5 fig, 6 ASAE Paper 75-2573.

Descriptors: *Sprinkler irrigation, *Evapora *Irrigation, *Irrigation effects, Water cons tion, Wind velocity, *Great Plains.
Identifiers: Southern Great Plains.

Water discharged from irrigation sprinklers caught in specially designed containers in ord determine evaporation losses during sprin Two nozzle sizes and three water pressures tested during the study period. When the av wind velocity was less than 4.5 m/s (10 mph evaporation losses were generally less than and the vapor pressure deficit had the greate fluence on the amount of evaporation. W average wind velocities were between 4.5 m/ 8.5 m/s, losses increased exponentially with velocity. The wind velocity was the predom factor under these conditions and evapor

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ranged from 10 to 30%. Since much of the rn Plains has an annual average wind y greater than 6 m/s, average evaporation can be expected to exceed 15%. rboe-Colorado State).
3004

KLER IRRIGATION PERCOLATION S,
tural Research Service, Morris, Minn.
ylla, and H. Shull.
ed at the 1975 Winter Meeting of the Amer-ciety of Agricultural Engineers, December 975, Chicago, Illinois. 8 p, 1 tab, 3 equ, 6 AE Paper 75-2572.

tors: *Sprinkler irrigation, *Percolation, ating water, Irrigation, Soil water, Soil novement, Irrigation effects, Uniformity ent, Estimating.

able procedure is presented for estimating r irrigation percolation losses. The method l on the amount of water applied, the soil e deficit, and the sprinkler distribution ity coefficient. (Skogerboe-Colorado
005

ERS FOR MONITORING RUNOFF S,
State Univ., Manhattan. Dept. of Agricul-gineering.
ıary bibliographic entry see Field 5A.
006

BLE, ADJUSTABLE FLOW-MEASUR-UME FOR SMALL CANALS,
ıral Research Service, Phoenix, Ariz. onservation Lab.
ary bibliographic entry see Field 4A.
07

ED IRRIGATION TAILWATER RU-FOR INCREASED WATER-USE EFFI-,
stern Great Plains Research Center, l, Tex.
neider, L. L. New, and J. T. Musick.
d at the 1975 Winter Meeting of the Amer-ety of Agricultural Engineers, December 75, Chicago, Illinois. 18 p, 4 fig, 4 tab, 8 E Paper 75-2541.

rs: *Return flow, *Irrigation effects, n practices, *Tailwater, Water conserva-rigation water, *Water utilization,

s: *Water use efficiency.

of tailwater runoff from 570-m long rrows did not significantly affect field ields of grain sorghum grown on a slowly e soil. Irrigation water-use efficiency ersely with the time of tailwater runoff. ns were: (1) The field average grain yield on 570-m long irrigated furrows of lay loam was not seriously affected by runoff duration. Major yield reduction only in the lower 180 m of the field; (2) r reducing tailwater runoff increases the water-use efficiency of grain sorghum graded-furrow irrigated Pullman clay results should be applicable to other sistant crops on similar soil; and (3) A lwater runoff irrigation procedure per-ting larger acreages with a fixed water kogerboe - Colorado State)
3

E MAINTENANCE PROGRAMS IN UNTIES,
Univ., Columbus. Cooperative Exten-e.

For primary bibliographic entry see Field 4A.
W76-13009

PHYSICAL-CHEMICAL COMPOSITION OF ERODED SOIL,
Purdue Univ., Lafayette, Ind. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2J.
W76-13010

LEAF WATER POTENTIAL AND MOISTURE BALANCE--FIELD DATA,
Agricultural Research Service, Auburn, Ala.; and Alabama Agricultural Experiment Station, Auburn.
For primary bibliographic entry see Field 2I.
W76-13011

MEETING FUTURE WATER REQUIREMENTS BY WATER CONSERVATION,
Soil Conservation Service, Golden, Colo.
J. D. Hedlund.
Presented at the 1975 Winter Meeting of the American Society of Agricultural Engineers, December 15-19, 1975, Chicago, Illinois. 10 p, 2 fig, 3 tab. ASAE Paper 75-2557.

Descriptors: *Water conservation, Irrigation, *Irrigation practices, *Water demand, Water utilization, Irrigation efficiency, Irrigation water, Water quality, Return flow, Water supply, *Water requirements.

Applying best management practices available to irrigation could (1) reduce 1975 withdrawals of 195 million acre-feet by 48 million acre-feet, (2) salvage 8 million acre-feet of incidental losses, (3) reduce pollutant-laden return flow by 47 million acre-feet and (4) meet year 2000 production demands. (Skogerboe - Colorado State)
W76-13013

FACTORS INFLUENCING THE LOSS OF NITROGEN AND PHOSPHORUS FROM A TRACT OF IRRIGATED LAND,
Idaho Univ., Moscow. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5G.
W76-13014

ESTABLISHING WATER, NUTRIENT AND TOTAL SOLIDS MASS BUDGETS FOR A GRAVITY-IRRIGATED FARM,
Idaho Univ., Moscow. Dept. of Agricultural Engineering.
D. W. Fitzsimmons, J. R. Busch, G. C. Lewis, D. V. Naylor, and R. D. Carlson.
Presented at the 1975 Winter Meeting of the American Society of Agricultural Engineers, December 15-18, 1975, Chicago, Illinois. 15 p, 3 fig, 5 tab, 5 ref. ASAE Paper 75-2544.

Descriptors: *Irrigation, *Irrigation practices, Furrow irrigation, *Surface irrigation, Evapotranspiration, Nutrients, Leaching, Return flow, Water pollution, *Computer models.
Identifiers: *Mass budgets(Total solids).

Mass budgets were established for a surface-irrigated farm and used to determine net losses of water, nutrients and solids from the farm. Data for establishing the budgets were obtained by monitoring surface flows and groundwater during two irrigation seasons. Flow and chemical analysis data were combined, using a computer model, to obtain the budgets. (Skogerboe - Colorado State)
W76-13015

IRRIGATION REUSE SYSTEMS--A PROPOSED NEW ASAE ENGINEERING PRACTICE,
Colorado State Univ., Fort Collins. Dept. of Agricultural.
For primary bibliographic entry see Field 3C.
W76-13016

SUSPENDED SEDIMENT AND TURBIDITY IN IRRIGATION RETURN FLOWS - A PROTOTYPE STUDY,
Soil Conservation Service, Spokane, Wash.
For primary bibliographic entry see Field 5B.
W76-13017

DEFLECTION-STIFFNESS CHARACTERISTICS OF CORRUGATED PLASTIC TUBING,
Ohio Agricultural Research and Development Center. Columbus.
For primary bibliographic entry see Field 4A.
W76-13018

PREDICTED VERSUS MEASURED DRAINABLE POROSITIES,
North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering.
For primary bibliographic entry see Field 4A.
W76-13019

AN EXPERIMENT WITH A LINEARLY INCREASING SPACING OF SUBSURFACE DRAINS,
Macdonald Coll., Ste. Anne de Bellevue (Quebec). Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 4A.
W76-13020

EFFECT OF OPENINGS ON INFLOW INTO CORRUGATED DRAINS,
Ohio Agricultural Research and Development Center, Columbus.
For primary bibliographic entry see Field 4A.
W76-13021

TILLAGE, MATRIC POTENTIAL, OXYGEN AND MILLET YIELD RELATIONSHIPS IN A LAYERED SOIL,
Agricultural Research Service, Florence, S.C. Coastal Plains Soil and Water Conservation Research Center.
R. B. Campbell, and C. J. Phene.
Presented at the 1975 Winter Meeting of the American Society of Agricultural Engineers, December 15-18, 1975, Chicago, Illinois. 17 p, 6 fig, 17 ref. ASAE Paper 75-2535.

Descriptors: *Oxygen, *Crop response, *Soil tests, Soil investigations, Soil environment, Soil horizons, Soil moisture, *Cultivation.
Identifiers: *Tillage effects, *Matric potential, *Millet.

A unique relationship was established between soil O2 content and soil water matric potential from which the O2 content may be estimated from soil matric potential data. Yield of millet was a function of soil O2 content from 2 to approximately 15%. At soil O2 levels greater than 15%, the growth of millet was independent of soil O2 content. Harvesting millet twice during the growing season which included a 14-day wet period produced significantly greater yields than harvesting three times. Chiseling the soil 35 cm deep one year before the experiment resulted in yields greater than those of the plowed soil, when the soil was in a wet condition, simulating a stormy 14-day period. Under a moderate soil water regime, in which the soil matric potential did not exceed -400 mb, aeration was adequate and the yield of millet was unaffected by tillage depth. Under high matric potential conditions, -45 to -87 mb, chiseling was beneficial as a means of partially alleviating soil oxygen stresses associated with a wet soil condition. (Skogerboe-Colorado State)
W76-13022

SOIL MOISTURE REGIME WITH SUBIRRIGATION,
Universidad del Valle, Cali (Colombia).
For primary bibliographic entry see Field 2G.
W76-13023

PLANT WATER STRESS CRITERIA FOR IRRIGATION SCHEDULING,
North Dakota State Univ., Fargo. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2G.
W76-13024

ENGINEERED IRRIGATION WELLS.
For primary bibliographic entry see Field 4B.
W76-13033

WATER USE BY DRYLAND CORN AS AFFECTED BY MATURITY CLASS AND PLANT SPACING,
Agricultural Research Service, Mandan, N. D. Northern Great Plains Research Center.
J. Alessi, and J. F. Power.
Agronomy Journal, Vol. 68, No. 4, p 547-500, July-August 1976. 3 fig, 4 tab, 12 ref.

Descriptors: *Water utilization, *Corn(Field), *Mature growth stage, *Crop response, Crop production, Soil water, Evapotranspiration, Plant populations, Soil-water-plant relationships, Efficiencies.

A study was conducted at Mandan, N. D., to determine the effects of row spacing and plant population on growth and water use by early dryland corn (Zea mays L.) hybrids. For 3 years, 68- and 85-day relative maturity class hybrids were grown at plant populations of 20, 30, 40, 60 and 74 thousand plants/ha in 50- and 100-cm rows on Temvik silt loam (Typic haploboroll). Soil water content was not affected by row spacing or location of the access tube with respect to the row. Water withdrawal by the crop was usually in the upper 90-cm soil depth, regardless of treatment. Greater populations generally increased water use during vegetative growth, leaving less water for reproductive growth. Soil water depletion was greater during the early growing season than after midseason when water use was highly dependent on precipitation. Water use efficiency was highest at a population of 40,000 plants, except for dry-matter production by the 85-RM hybrid at the largest population. The early maturing hybrid was more efficient in water use for grain production, while the later maturing hybrid was more efficient for forage production. The early maturing hybrid may also be less affected by severe drought. (Jahns-Arizona)
W76-13124

ASPECTS OF SOIL SALINITY AND SODICITY IN RELATION TO IRRIGATION AND RECLAMATION,
Volcani Inst. of Agricultural Research, Bet-Dagan (Israel). Dept. of Soil and Water.
For primary bibliographic entry see Field 3C.
W76-13126

COMBINED IRRIGATION AND FERTILIZATION OF TOMATOES GROWN ON SAND DUNES,
Volcani Inst. of Agricultural Research, Bet-Dagan (Israel). Div. of Soil Chemistry and Plant Nutrition.
For primary bibliographic entry see Field 3C.
W76-13127

RANGE FERTILIZATION IN THE NORTHERN GREAT PLAINS,
Agricultural Research Service, Sidney, Mont. Northern Plains Soil and Water Research Center.
For primary bibliographic entry see Field 4A.
W76-13131

GENOTYPE VARIATION IN NUTRIENT UPTAKE EFFICIENCY IN CORN,
New York State Univ. Agriculture and Technology Coll. at Cobleskill.
T. F. Bruetsch, and G. O. Estes.
Agronomy Journal, Vol 68, No 3, p 521-523, May-June 1976. 2 tab, 19 ref.

Descriptors: *Corn(Field), *Plant growth, *Nutrient requirements, Mature growth stage, Phosphorus, Root systems, Root development, *Absorption.
Identifiers: *Nutrient uptake(Corn), Dry matter.

Nutrient uptake varied significantly for 12 corn genotypes of commercial importance and of varying maturity under field conditions. Relative maturity was based on the percentage of dry matter (% DM) after 115 days of growth. There were significant positive correlations between % DM and foliage P concentration and content, indicating that earlier maturing genotypes had higher P levels. Genotypes varied in terms of dry weight production per gram of N, P, K, Ca and Mg absorbed, with the relationship between P concentration and relative maturity being most consistent. A significant negative correlation between % DM and DM/g of P absorbed indicated more efficient P use by the later maturing corn lines in terms of dry matter production. Such response may be due to the ability of roots to penetrate soil and physically contact more soil P. (Jahns-Arizona)
W76-13134

IRRIGATION SYSTEM CONTROLLER,
International Electric Corp., Chicago, Ill. (Assignee).
C. K. Sears.
U. S. Patent No. 3,961,753, 11 p, 8 fig, 10 ref; Official Gazette of the United States Patent Office, Vol 947, No 2, p 655-656, June 8, 1976.

Descriptors: *Patents, *Irrigation, *Irrigation systems, *Distribution systems, *Irrigation efficiency, *Monitoring, Instrumentation, Orchards, Citrus fruits, Moisture content, Moisture meters.
Identifiers: Drip irrigation.

An irrigation system controller operationally ties the dispensing of water to the soil directly to its need without requiring continuous monitoring by the irrigation manager. If a preselected water supply period is not sufficient to attain a desired moisture content in the soil due either to an insufficient estimate on the part of the manager or a power or equipment failure or unforeseen change in weather, a warning device or other electrically-operated signal calls attention to the need for the selection of a new longer water supply period or a correction of the power or equipment failure. A pushbutton switch resets the warning system. If the preselected water supply period is sufficient to maintain the desired moisture content, a feed-back loop automatically controls the dispensation of water to maintain the desired moisture content of the soil. (Sinha-OEIS)
W76-13137

LAWN SPRINKLING AND SIMILAR INSTALLATIONS,
Carpano and Pons S.A. (France). (Assignee).
M. Chauvigne.
U. S. Patent No. 3,964,685, 5 p, 11 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 947, No 4, p 1624, June 22, 1976.

Descriptors: *Patents, *Irrigation, *Sprinkler irrigation, *Irrigation efficiency, Irrigation practices, Water distribution(Applied), Automatic control, Application equipment.

A lawn sprinkling installation has a series of dosing valves arranged in cascade to each successively deliver a set quantity of water to a sprinkler. Each dosing valve has a hinged clapper biased to normally open a first outlet leading to the sprinkler and close a second outlet connected to the inle
the successive dosing valve Volumetric do
means hold each clapper to close the first o
and open the second after delivery of a regul
quantity of water and hold the clapper as lo
the water pressure is maintained When the
dosing valve shuts off supply to the last sprin
a gate valve supplying the first dosing valve i
tomatically or manually closed to allow wat
the pipes joining the dosing valves to drain thr
a discharge orifice, thus enabling auto
resetting of the clappers. (Sinha-OEIS)
W76-13157

LAWN, FARM, AND ORCHARD SPRINKLE
K. T. Sheets.
U. S. Patent No. 3,964,688, 7 p, 16 fig, 6 ref;
cial Gazette of the United States Patent Of
Vol 947, No 4, p 1625, June 22, 1976.

Descriptors: *Patents, *Irrigation, *Sprinkle
rigation, *Irrigation efficiency, Irrigation p
tices, Water distribution(Applied), Applic
equipment.

The invention relates to projectable sprin
with a rotating nozzle or nozzles which are
matically projected or advanced to a po
above the surrounding ground level when wa
supplied under pressure to the sprinkler; to
kler heads which can be used on a projectab
non-projectable sprinkler; to stationary sprin
for use on the surface of the ground; and to a
paratus for increasing the area wetted by a
kler. The projectable sprinklers include a proj
ble float having a sprinkler head attached t
top end, a housing in which the projectable
moves, and a water supply attached to the
kler head. The apparatus for increasing the w
area around the sprinkler includes a disc mou
on top of a sprinkler head having a movable
(Sinha-OEIS)
W76-13158

THE USE OF LINEAR PROGRAMM TECHNIQUES FOR ESTIMATING BENEFITS FROM INCREASED ACCURACY WATER SUPPLY SYSTEMS,
Battelle Memorial Inst., Columbus, Ohio.
For primary bibliographic entry see Field 6A.
W76-13169

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

A NON-LINEAR PROGRAMMING MODEL EVALUATING WATER SUPPLY POLICIE THE TEXAS COASTAL ZONE,
Texas Univ. at Austin.
For primary bibliographic entry see Field 6D.
W76-12680

AN EVALUATION OF TWO HYDROGR SEPARATION METHODS OF POTENTIAL IN REGIONAL WATER QUALITY ASS MENT,
Oak Ridge National Lab.,Tenn.
For primary bibliographic entry see Field 5G.
W76-12691

MAP SHOWING POTENTIAL SOURCES GRAVEL AND CRUSHED-ROCK AGGREG IN THE COLORADO SPRINGS-CASTLE R AREA, FRONT RANGE URBAN CORRI COLORADO,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 7C.

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12787

D-USE CLASSIFICATION MAP OF THE ORADO SPRINGS--CASTLE ROCK AREA, NT RANGE URBAN CORRIDOR, ORADO,
gical Survey, Denver, Colo.
rimary bibliographic entry see Field 7C.
12788

SHOWING POTENTIAL SOURCES OF VEL AND CRUSHED-ROCK AGGREGATE HE BOULDER-FORT COLLINS-GREELEY A, FRONT RANGE URBAN CORRIDOR, ORADO,
gical Survey, Denver, Colo.
imary bibliographic entry see Field 7C.
12789

D-USE CLASSIFICATION MAP OF THE LDER-FORT COLLINS-GREELEY AREA, T RANGE URBAN CORRIDOR, ORADO,
gical Survey, Denver, Colo.
imary bibliographic entry see Field 7C.
2790

OF ROCK TYPES IN BEDROCK OF AL-ENY COUNTY, PENNSYLVANIA,
gical Survey, Harrisburg, Pa.
imary bibliographic entry see Field 7C.
2791

OLOGIC UNIT MAP--1974, STATE OF ANA.
gical Survey, Reston, Va.
mary bibliographic entry see Field 7C.
2793

SHOWING POTENTIAL SOURCES OF EL AND CRUSHED-ROCK AGGREGATE E GREATER DENVER AREA, FRONT E URBAN CORRIDOR, COLORADO,
ical Survey, Denver, Colo.
mary bibliographic entry see Field 7C.
2796

OLOGIC DATA FOR URBAN STUDIES E DALLAS, TEXAS METROPOLITAN 1974,
ical Survey, Austin, Tex.
nary bibliographic entry see Field 7C.
804

F HYDROLOGIC APPRAISAL OF THE -4, 1975, FLASH FLOOD IN LAS VEGAS Y, NEVADA.
cal Survey, Carson City, Nev.
tzer, P. A. Glancy, and L. Harmsen.
le report 76-100, 1976. 40 p, 22 fig, 1 plate, ref.

tors: *Flash floods, *Flood data, *Flood Sediment transport, *Flood damage, Flood e, Storm runoff, Thunderstorms, Data ns, Hydrographs, Aerial photography, Nevada.
rs: *Las Vegas Valley(Nev), Tropicana lamingo Wash, Las Vegas Creek.

thunderstorm precipitation on the after-July 3, 1975, between metropolitan Las nd the mountains to the south, west, and nused flash flooding in the city area. Total recipitation equaled or exceeded 3 inches areas. The total storm yield on the area of nt runoff was probably between 20,000 00 acre-feet of water. Of this amount, less than 3,000 acre-feet flowed directly Mead. Peak flows of Tropicana Wash, Flamingo Wash, Las Vegas Creek, and Las Vegas Wash were the highest ever determined. Flooding caused the loss of two lives and inflicted extensive property damage. Total damage was reportedly estimated by the Clark County Flood Control District at $4-5 million. Problems associated with sediment erosion, transportation, and deposition occurred throughout the flooded area. An unknown amount of the material transported during the flood was deposited in Lake Mead near the mouth of Las Vegas Wash. Lateral erosion appeared more prominent than vertical erosion along most major channels, except on Las Vegas Wash at Northshore Road where downcutting threatened the loss of the highway. Sediment deposits were particularly noticeable and troublesome in Flamingo Wash at Caesars Palace parking lot and on the Winterwood Golf Course near the junction of Flamingo Wash and Las Vegas Wash. (Woodard-USGS)
W76-12806

SELECTED EFFECTS OF SUBURBAN DEVELOPMENT ON RUNOFF IN SOUTH-COASTAL, CALIFORNIA.
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 4C.
W76-12810

PLAN OF WORK, RED RIVER BASIN ABOVE DENISON DAM.
Soil Conservation Service, Temple, Tex.
Type IV Cooperative River Basin Survey, July 1975. 60 p, 2 fig.

Descriptors: *River basins, *Surveys, *Planning, *Texas, *Oklahoma, Rivers, Watersheds(Basins), Dams, Basins, Water supply, Water quality, Surface waters, Water resources, Agriculture, Forests, Drainage, Economics, Recreation, Land use, Environment, Evaluation, Projects, River basin development.
Identifiers: *Red River Basin(Tex-Okla), *Denison Dam(Tex-Okla).

The Red River Basin Above Denison Dam extends from eastern New Mexico across the Texas Panhandle to Denison Dam on the Oklahoma-Texas boundary. In 1970 and 1971, the U.S. Department of Agriculture received requests from the Oklahoma Conservation Commission, the Oklahoma Water Resources Board, the Texas Water Development Board, the Texas State Soil and Water Conservation Board, and the Texas Water Rights Commission to participate in a Type IV cooperative study of the Red River Basin Above Denison Dam. The overall objective of the study was to determine the capability of water and land resource projects and programs for solving problems and meeting needs of the basin. The U.S. Department of Agriculture agreed to participate under the authority and provisions of Section 6 of Public Law 83-566, as amended. It was essential that plans for water and land resource development in the Red River Basin Above Denison Dam be compatible with the principles, objectives, plans, and programs in Oklahoma and Texas, respectively. It was also essential that the plans finally developed be compatible with efficient and effective land treatment programs, water management, administration, and supervision under applicable State and Federal authorizations and responsibilities. (Sims-ISWS)
W76-12816

A CONDUCTIVITY FLOW METER,
Department of Scientific and Industrial Research, Taupo (New Zealand). Ecology Div.; and Department of Scientific and Industrial Research, Taupo (New Zealand). Freshwater Section.
For primary bibliographic entry see Field 7B.
W76-12825

A MATHEMATICAL MODEL FOR FLOOD-WAVE FORECASTING BY MEANS OF WARNING BASINS,
Institutul de Meteorologie si Hidrologie, Bucharest (Rumania).
C. Diaconu, and V. Al. Stanescu.
Hydrological Sciences Bulletin, Vol. 21, No. 1, p 77-80, March 1976. 1 fig, 1 tab.

Descriptors: *Mathematical models, *Flood waves, *Basins, *Forecasting, Model studies, Runoff, Warning systems, Precipitation, Hydrologic cycle, Equations, Runoff forecasting.
Identifiers: *Target basin, *Romania, *Flood wave forecasting, *Mures River, Warning basins, Fortran IV, Precipitation components.

An approach was proposed to eliminate the difficulties surrounding the direct use of precipitation components to forecast runoff. Precipitation data and runoff coefficients were obtained for small selected warning basins in the forecast area (target basin), and the runoff from the warning basins was accurately determined. These values were routed into the runoff values of the target basin using a modified isochrone method. The damping effect of the flow of the network was taken into account. An algorithm for the runoff of the target basin was given. The computation was done using Fortran IV, and examples of computed and actual hydrographs were given for the flood on the Mures River in May 1970. (Roberts-ISWS)
W76-12829

COMPARISON OF REQUIRED RESERVOIR STORAGES COMPUTED BY THE THOMAS-FIERING MODEL AND THE 'KARLSRUHE MODEL' TYPE A AND B,
Karlsruhe Univ. (West Germany). Institut fuer Wasserbau III.
B. Treiber, and G. A. Schultz.
Hydrological Sciences Bulletin, Vol. 21, No. 1, p 177-185, March 1976. 5 fig, 4 tab, 6 ref.

Descriptors: *Reservoir storage, *Synthetic hydrology, *Model studies, Computers, *Reservoir yield, Laboratory tests, Graphical analysis, Flows, Hydrologic data, Analytical techniques, Hydrology.
Identifiers: *Thomas-Fiering model, *Karlsruhe model, *Black Forest mountains, Hurst coefficient.

Design of water supply reservoirs, i.e. the determination of required reservoir capacity, often requires use of the Rippl method on the basis of observed monthly flow data. This technique has two major drawbacks: (1) the observed data are subject to sampling errors influencing the design results, (2) the coarse time discretization produces too small required reservoir capacities. In order to reduce the sampling errors, designs are often based on many time series of synthetically generated data. There are several models available which generate monthly flow data. The results when using the Thomas-Fiering model and when using the Karlsruhe generating model, type A, were compared. Reservoir capacities were also determined using Karlsruhe model, type B, for daily flows. For a reservoir in the Black Forest Mountains in south Germany, the reservoir capacities were shown to be higher with the Thomas-Fiering model and lower with the Karlsruhe model than those capacities given by the 45 years historical data of monthly flows. When the Karlsruhe model with daily flows was used, the desired capacities at full development were about 2 to 5% higher than with the monthly flows. The capacities were shown to be substantially higher with daily flows if the level of development was only 44%. (Singh-ISWS)
W76-12832

ATMOSPHERIC INPUT OF SOME CATIONS AND ANIONS TO FOREST ECOSYSTEMS IN NORTH CAROLINA AND TENNESSEE,
Forest Service (USDA), Franklin, N.C. Coweeta Hydrologic Lab.
For primary bibliographic entry see Field 2K.
W76-12838

MAJOR JUNCTION STRUCTURE VERIFIED BY MODELING,
Santa Barbara County Water Agency, Los Angeles, Calif.
For primary bibliographic entry see Field 8B.
W76-12840

URBAN STORMWATER RUNOFF: DETERMINATION OF VOLUMES AND FLOWRATES,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W76-12858

TIOGA RIVER MINE DRAINAGE ABATEMENT PROJECT,
Pennsylvania Dept. of Environmental Resources, Harrisburg.
For primary bibliographic entry see Field 5G.
W76-12874

COMPUTER HALTS FLOODING COMPLAINTS,
Watermation, Inc., Saint Paul, Minn.
For primary bibliographic entry see Field 5D.
W76-12905

EVALUATION OF THE REPORT ON INTERCEPTOR SEWERS AND SUBURBAN SPRAWL.
Environmental Protection Agency, Washington, D.C. Office of Planning and Evaluation.
For primary bibliographic entry see Field 5D.
W76-12915

IMPACTS OF RECREATIONAL DEVELOPMENT: THE VOYAGER VILLAGE EXPERIENCE,
Wisconsin Planning Office, Madison.
For primary bibliographic entry see Field 6B.
W76-12965

SELECTIVE WITHDRAWAL CRITERIA OF STRATIFIED FLUIDS,
Catholic Univ. of America, Washington, D. C. Dept. of Civil and Mechanical Engineering.
For primary bibliographic entry see Field 8B.
W76-12970

CLASSIFICATION AND ANALYSIS OF RIVER PROCESSES,
For primary bibliographic entry see Field 8B.
W76-12973

SHAPE AND SIZE OF ALLUVIAL CANALS,
Central Water and Power Research Station, Poona (India).
For primary bibliographic entry see Field 8B.
W76-12975

EFFECTS OF OVERBANK FLOW IN FLOOD COMPUTATIONS,
Asian Inst. of Tech., Bangkok (Thailand). Div. of Water Resources Engineering.
For primary bibliographic entry see Field 2E.
W76-12976

FLOODWATER RETARDING STRUCTURE YIELD IMPACT,
Agricultural Research Service, Chickasha, Okla. Southern Plains Branch.
E. H. Seely.
Transactions of the American Society of Agricultural Engineers, Vol. 19, No. 3, p 520-523, May-June 1976. 7 fig, 2 tab, 16 ref.

Descriptors: *Flood protection, *Watershed management, *Water yield, *Runoff, *Oklahoma, *Texas, Inflow, Outflow, Subsurface flow, Water conservation, Evaporation, Water loss.
Identifiers: *Washita River, *Floodwater retarding structure.

The upstream watershed-protection and flood-prevention program of the Soil Conservation Service is very important to agriculture. Knowledge of the magnitude of impact of the program on downstream runoff yield in water-scarce areas is also important. One of the primary program elements, the floodwater-retarding structure (FRS), has potential impact on yield of surface runoff. Reliable yield impact estimates are needed to protect downstream users and to avoid excessive restrictions on the upstream programs. Published information on downstream impact of FRS was reviewed and analyzed. The information found was neither satisfactory nor accurate enough for the Oklahoma-Texas area, where most of the structures and most of the concern about downstream impact are located. (Lardner - ISWS)
W76-12978

A MATHEMATICAL MODEL OF THE 'RESERVOIR' TYPE DESIGNED FOR FLOOD-WAVE MODELLING AND FORECASTING,
Institutul de Meteorologie si Hidrologie, Bucharest (Rumania).
For primary bibliographic entry see Field 2A.
W76-12979

AN ADAPTIVE IDENTIFICATION AND PREDICTION ALGORITHM FOR THE REAL-TIME FORECASTING OF HYDROLOGICAL TIME SERIES,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
For primary bibliographic entry see Field 2A.
W76-12980

DATA ANALYSIS AND SYSTEM MODELLING IN URBAN CATCHMENT AREAS (IN THE NEW TOWN OF LELYSTAD, THE NETHERLANDS),
IJsselmeerpolders Development Authority, Lelystad (Netherlands). Scientific Div.
For primary bibliographic entry see Field 2A.
W76-12981

PORTABLE, ADJUSTABLE FLOW-MEASURING FLUME FOR SMALL CANALS,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
J. A. Replogle.
Presented at the 1975 Winter Meeting of the American Society of Agricultural Engineers, December 15-18, 1975, Chicago, Illinois. 25 p. 5 fig, 2 append, 5 ref. ASAE Paper 75-2558.

Descriptors: *Flow measurement, *Flumes, *Portability, *Water measurement, Flow rates, Water conservation, Canals, *Irrigation canals.
Identifiers: *Portable flumes.

A portable flume-site survey flume was constructed and used to verify siting of permanent metering flumes. The portable system consists of a trapezoidal throat that can be raised and lowered in a flowing field ditch to establish limits of unsubmerged operation and backwater effects on upstream structures. Mechanical solutions to problems of maintaining gage-zero on a movable throated flume, stilling well readout, and movable seals between ditch and flume were presented. A family of concrete throat sections, differing only in height of installation from the flume floor, were recommended for the permanent installations. Flows between about 0.5 cfs (0.01 m3/s) and 25 (0.7 m3/s) can be measured with the port system. Satisfactory operation can be achie with less than 4 inches (10 cm) head loss to canal system. Permanent structures can be stalled with high assurance that they will ope as intended, be convenient enough to be routi used and rugged enough to remain reliable and curate. (Skogerboe - Colorado State)
W76-13007

REDUCED IRRIGATION TAILWATER NOFF FOR INCREASED WATER-USE E CIENCY,
Southwestern Great Plains Research Ce Bushland, Tex.
For primary bibliographic entry see Field 3F.
W76-13008

DRAINAGE MAINTENANCE PROGRAMS OHIO COUNTIES,
Ohio State Univ., Columbus. Cooperative E sion Service.
B. H. Nolte.
Presented at the 1975 Winter Meeting of the A ican Society of Agricultural Engineers, Dece 15-19, 1975, Chicago, Illinois. 4 p, 2 tab, 7 ASAE Paper 75-2502.

Descriptors: *Drainage programs, *Drainag gineering, *Ohio, Cost analysis, *Mainten *Maintenance costs, *Channel improvement.
Identifiers: *Drainage system maintenance.

Drainage maintenance programs have incre dramatically in Ohio counties during the pa years. Over 11,000 km of channel are being tained. It is estimated that an additional 97 hectares could have better drainage from f outlet construction and maintenance in (Skogerboe - Colorado State)
W76-13009

DEFLECTION-STIFFNESS CHARACTERIS OF CORRUGATED PLASTIC TUBING,
Ohio Agricultural Research and Develop Center. Columbus.
G. O. Schwab, and C. J. W. Drablos.
Presented at the 1975 Winter Meeting of the A ican Society of Agricltural Engineers, Dec 15-18, 1975. Chicago, Illinois. 11 p, 2 fig, 4 ref. ASAE Paper 75-2528.

Descriptors: *Plastic, *Plastic deform *Plastic pipes, Drainage, Drainage prac Equipment, Pipes, Ohio, Indiana, Illinois.
Identifiers: *Corrugated plastic pipe.

Deflection of corrugated plastic tubing replicated field tests and from farm installati Ohio, Indiana, and Illinois was measured aft to four years following installation. Comm tubing sizes varied from 102 to 381 mm (4 to in diameter. The purpose was to confirm p standards and to collect supporting dat development of standards for large-size tubi the replicated tests from two manufacturer mm (4-in.) tubing deflection decreased linearly with an increase in stiffness. Max deflections after 4 years were less than 17 pe All but one test sample was below ASTM F stiffness standards. About 80 per cent deflection occurred during the first two year essentially no difference between the thir fourth year. Average differences in deflecti 60- and 120-degree groove angles were wi mm (0.08 in.) or less than the accuracy of me ment. (Skogerboe-Colorado-State)
W76-13018

PREDICTED VERSUS MEASURED DR BLE POROSITIES,
North Carolina State Univ., Raleigh. De Biological and Agricultural Engineering.
R. W. Skaggs, L. G. Wells, and S. R. Ghate.

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resented at the 1975 Winter Meeting of the Amer-an Society of Agricultural Engineers, December 5-18, 1975, Chicago, Illinois. 20 p, 8 fig, 3 tab, 9 f.ASAE Paper 75-2527.

escriptors: *Drainage engineering, *Drainage actices, Drains, Soil water, Soil water move-ent, Cores, Soil tests, Soil investigations.

xperiments were conducted on large field cores determine the relationship between drainage lume and water table depth for five soils. The easured drainage volumes were less than pre-cted from the soil water characteristics for all t one soil, for which measured and predicted sults were in good agreement. Drainable porosi-s were calculated from both theoretical and ex-rimental drainage volume-water table depth ationships by assuming that the unsaturated ne is essentially 'drain to equilibrium' to the ter table. The experimental drainable porosities as obtained were less than observed. kogerboe-Colorado-State)
76-13019

EXPERIMENT WITH A LINEARLY IN-EASING SPACING OF SUBSURFACE AINS,
cdonald Coll., Ste. Anne de Bellevue (Quebec). pt. of Agricultural Engineering.
S. Broughton, and C. K-W. Tu.
sented at the 1975 Winter Meeting of the Amer-n Society of Agricultural Engineers, December 18, 1975, Chicago, Illinois. 23 p, 9 fig, 3 tab, 10 ASAE Paper 75-2526.

scriptors: *Drainage, *Drainage effects, ainage practices, *Drainage systems, Crop onse, Soil water, Soil water movement.

surface drainage systems with diagonal drains ween parallel drains were installed to give cings varying continuously 6 to 60M on a imum of land. Three drain depth replicates e used. Indications of the effects of depth and cing of drains on water table depths, maize ds and soil trafficability were provided. gerboe-Colorado-State)
5-13020

FECT OF OPENINGS ON INFLOW INTO RRUGATED DRAINS,
Agricultural Research and Development ter, Columbus.
. Bravo, and G. O. Schwab.
ented at the 1975 Winter Meeting of the Amer-Society of Agricultural Engineers, December 8, 1975, Chicago, Illinois. 13 p, 6 fig, 3 tab, 11 ASAE Paper 75-2525.

criptors: *Orifices, *Orifice flow, *Drainage, inage engineering, *Drainage practices, hematical models, Model studies.
tifiers: Plastic drains.

relative effectiveness of the openings in cor-ed plastic drains, as influenced by the nce of soil within the corrugations and within penings themselves was evaluated from the lpoint of water inflow for saturated condi-in a homogeneous, isotropic soil using a -dimensional electric analog and mathemati-odels. (Skogerboe-Colorado State)
13021

LIC PARTICIPATION IN WATER OURCES PLANNING: AN EVALUATION THE PROGRAMS OF 15 CORPS OF EN-ER DISTRICTS-SUMMARY OF EVALUA-AND RECOMMENDATIONS,
(James) Associates, Pacific Palisades,

rimary bibliographic entry see Field 6E.
13041

PUBLIC PARTICIPATION IN WATER RESOURCES PLANNING: AN EVALUATION OF THE PROGRAMS OF 15 CORPS OF ENGINEERS DISTRICTS,
Ragan (James) Associates, Pacific Palisades, Calif.
For primary bibliographic entry see Field 6E.
W76-13042

FLOOD PLAIN INFORMATION, LOWER BUFFALO CREEK AND ITS TRIBUTARIES, NAHUNTA AND BRANTLEY COUNTY, GEORGIA.
Army Engineer District, Savannah, Ga.
Prepared for Nahunta and Brantley County, Georgia, October 1972. 28 p, 53 plates, 11 fig, 5 tab.

Descriptors: *Floods, *Flood plains, *Flood profiles, *Flow duration, *Streamflow Forecasting, *Georgia), Storms, Hurricanes, Historic floods, Flood frequency, Flood stages, Flood peak, Flow characteristics, Warning systems.
Identifiers: *Buffalo Creek(Ga), Nahunta(GA), Brantley County(GA), Satilla River(GA), Standard Project Flood, Intermediate Regional Flood.

Buffalo Creek, a tributary of the Satilla River, with a drainage area of 160 square miles, subjects portions of the city of Nahunta and Brantley County to periodic flooding. With average slopes of 3.5 feet per mile, Buffalo Creek and its tributaries have flood plains which are largely undeveloped, currently heavily wooded and swampy. Several homes and businesses in the vicinity of Nahunta are subject to periodic flooding. Bridges, culverts, sand and soil deposits, and vegetation can obstruct floodflows. Seven large floods have occurred since 1929 as the result of thunderstorms, general rainstorms, and hurricanes or tropical storms. The most recent serious flooding occurred in 1969 when flood heights reached 38.7 feet above mean sea level and caused severe damage in the study area. The Intermediate Regional Flood and the Standard Project Flood would reach heights of 40.5 ft and 45.5 above MSL, respectively, and would have peak discharges of 6,440 and 16,100 cubic feet per second, respectively, on Buffalo Creek at Road B. The IRF would typically rise 10 feet in 12 hours and remain above bankfull 24 hours. Channel and overbank velocities would reach 6 and 14 feet per second, respectively. Considerable damage would be caused by an IRF. The SPF can be expected to rise 15 feet in 18 hours and remain above bankfull for 48 hours. Due to the wider extent, greater depths of flooding, higher velocity and longer duration of flooding, the Standard Project Flood would be disastrous. The National Weather Service issues flood warnings for the area. There are no existing city or county flood ordinances. (Henley, North Carolna.)
W76-13045

FLOOD PLAIN INFORMATION: SCIOTO AND OLENTANGY RIVERS, OHIO, CHILLICOTHE AREA SUMMARY REPORT,
Army Engineer District, Huntington, W. Va.
Prepared by Dodson, Kinney and Lindblom, consulting engineers, Columbus, Ohio, for the Ohio Department of Natural Resources, October 1966. 19 p, 14 fig, 6 plates.

Descriptors: *Floods, *Flood profiles, *Flood plains, *Ohio, Flood data, Historic floods, Flood protection, Non-structural alternatives, Control structures.
Identifiers: *Scioto River(OH), *Olentangy River(OH), *Chillicothe(OH).

This summary of a main report covers the Scioto River, Paint Creek and North Fork flood plains in the Chillicothe area. The population of Ross County is expected to increase by only a third between 1960 and 1985 with anticipated growth in flood plain areas. The Chillicothe flood plain, the second largest flood damage center in the Scioto River Basin, contains residential and commercial development which would be inundated by backwater flooding from Scioto River or from headwater flooding on Paint Creek and result in costly damages. The greatest flood in March 1913 caused $2.5 million damages, and 18 lives were lost. A flood of this magnitude today would cause damages of $30 million. Although the Delaware Reservoir (OH) has partly reduced flooding, a major flood on the Scioto River in January 1959, cresting at 7 feet below the 1913 flood and having half the flood flow, caused extensive damages. Severe damages to railroad structures and highways resulted from flooding in March 1963 and March 1964 on Paint Creek. Flood control proposals include 6 reservoirs, one of which is completed (the Delaware Reservoir in 1951), floodwalls, levees, and pumping stations. Existing flood plain management controls include Chillicothe's zoning regulations which could be used effectively to control flood plain developments. Guidelines for reducing future flood damages are described and include flood control works and flood plain management. (Salzman-North Carolina).
W76-13046

FLOOD PLAIN INFORMATION: VERDIGRIS, FALL AND ELK RIVERS, KANSAS.
Army Engineer District, Tulsa, Okla.
Prepared for the Kansas Water Resources Board, State of Kansas, Topeka, Kansas, January 1966. 39 p, 5 fig, 25 plates, 20 tab, 34 ref.

Descriptors: *Floods, *Flood forecasting, *Flood profiles, Historic floods, Flood data, *Flood plains, *Kansas, Floodwater, Flooding, Flash flood, Streamflow forecasting, Maximum probable flood, Peak discharge, Levee, Dams, Reservoirs.
Identifiers: *Verdigris River(KS), *Fall River(KS), *Elk River(KS), Coffeyville(KS), Coyville(KS), Altoona(KS), Frendonia(KS), Elk City(KS), Independence(KS), Lenapah(OK), Standard Project Flood.

This study covers the southeast corner of Kansas including several towns and villages plus extensive agricultural areas. Fall and Elk Rivers, with drainage areas of 884 and 702 square miles, respectively, are principal tributaries of the Verdigris River which drains 3,354 sq mi. They are streams of generally low slope which join the Arkansas River in Oklahoma. The comparatively flat valleys of the these streams have been subject to frequent and extensive flooding. Excessive rainfall in months April through November is the chief cause of flooding. Flash floods sometimes occur. At least 6 major floods have occurred since 1885, the largest on the Verdigris River being the 1951 flood, and on the Elk River, the 1961 flood. Peak discharges recorded have been 130,000 cubic feet per second on the Verdigris River (1951), 49,000 cfs on the Fall River (1945), and 100,000 cfs on the Elk River (1961). No detailed record of damages is given in this report. It is estimated that the Fall River and Tornoto Reservoirs have prevented about $13 million in damages through 1966. The Elk City and Big Hill Reservoirs were scheduled for completion in 1966 and 1970. It is estimated that with the four reservoirs in place bankfill capacity would be exceeded once in 2 years in Independence, KS, compared to more than twice a year without the reservoirs. On the Verdigris it is estimated that peak discharges of 64,000 cfs and 139,000 cfs would occur at the lower end of the study area during a 50 year flood and Standard Project Flood. Corresponding figures for the Fall River are 37,000 cfs and 104,000 cfs, and for the Elk River, 15,500 cfs and 29,400 cfs respectively. (Smith-North Carolina)
W76-13047

THE IMPACT OF SUBURBANIZATION ON THE STREAM CHANNEL NETWORKS OF

RALSTON CREEK AND SOUTH BRANCH, IOWA,
Iowa Univ., Iowa City. Dept. of Geography.
For primary bibliographic entry see Field 4C.
W76-13051

ANNUAL REPORT FOR THE YEAR ENDING MARCH 31, 1975, SASKATCHEWAN DEPARTMENT OF THE ENVIRONMENT.
Saskatchewan Dept. of the Environment, Regina.
For primary bibliographic entry see Field 6E.
W76-13052

FLOOD HAZARD ANALYSES: ROYAL RIVER AND CHANDLER BROOK, TOWN OF NORTH YARMOUTH, MAINE.
Soil Conservation Service, Washington, D.C.
Prepared for the Town of North Yarmouth, Maine. June 1975. 46 p, 4 fig, 13 plates, 2 tab, 2 append.

Descriptors: *Floods, *Flood profiles, *Flood plains, *Maine, Streamflow forecasting, Flood forecasting, Historic floods, Flood data, Peak discharge, Non-structural alternatives, Zoning, Control structures.
Identifiers: *Royal River(ME), Chandler Brook(ME), *North Yarmouth(ME), 100-year flood, 500-year flood.

In the watershed, dairying is the principal enterprise. Little land is devoted to uses other than agriculture and woodland, though development pressure in North Yarmouth is increasing. Chandler Brook with a drainage area of 52 square miles is a tributary of Royal River which drains 142 sq mi. For the state of Maine as a whole, most floods occur in months March through April, and November, with the rest of the floods distributed throughout the remaining portion of the year. Streamgage records, available for Yarmouth since 1949, indicate the largest flood occurred in September 1954 when Hurricane Edna passed through the state and 7.49 inches of rain were measured at Portland ME. The peak discharge was 7,960 cubic feet per second, approximately a 100 year frequency. In November 1966 a discharge of 5,040 cfs was recorded, an 8 year frequency. In 1954 damage was estimated at $40,000 on highways and bridges throughout the watershed along with scattered commercial and residential properties. Results of surveys and calculations indicate peak discharges in a 100 year flood would be 8,000 cfs on Royal River, at confluence with Chandler Brook, and 3,950 cfs on Chandler Brook at the same location. In a 500 year flood, peak discharges of 9,600 cfs and 4,950 cfs are predicted for Royal River and Chandler Brook, respectively. Maine has adopted a Mandatory Zoning and Subdivision Control Law which requires municipal adoption of zoning and subdivision control ordinances for shoreline areas within 250 feet of the normal high water mark of any pond, river or salt water body. An appendix of this report contains a model zoning ordinance. (Smith-North Carolina)
W76-13053

COMPILING BATHYMETRY FOR FLOW SIMULATION MODELS,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W76-13064

WATER RESOURCES DATA FOR SOUTH CAROLINA, WATER YEAR 1975.
Geological Survey, Columbia, S. C.
For primary bibliographic entry see Field 7C.
W76-13066

WATER RESOURCES DATA FOR NORTH CAROLINA, WATER YEAR 1975.
Geological Survey, Raleigh, N.C.
For primary bibliographic entry see Field 7C.
W76-13067

WATER RESOURCES DATA FOR SOUTH DAKOTA, WATER YEAR 1975.
Geological Survey, Huron, S. Dak.
For primary bibliographic entry see Field 7C.
W76-13073

WATER RESOURCES DATA FOR IOWA, WATER YEAR 1975.
Geological Survey, Iowa City, Iowa.
For primary bibliographic entry see Field 7C.
W76-13074

WATER RESOURCES DATA FOR KENTUCKY, WATER YEAR 1975.
Geological Survey, Louisville, Ky.
For primary bibliographic entry see Field 7C.
W76-13075

SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART 5. HUDSON BAY AND UPPER MISSISSIPPI RIVER BASINS--VOLUME 2. UPPER MISSISSIPPI RIVER BASIN ABOVE KEOKUK, IOWA.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W76-13076

INDEX TO NATIONAL TOPOGRAPHIC MAPS: 1:250,000-SCALE SERIES.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W76-13077

ESTIMATING PEAK DISCHARGES FROM SMALL DRAINAGES IN NEVADA ACCORDING TO BASIN AREAS WITHIN ELEVATION ZONES,
Geological Survey, Carson City, Nev.
D. O. Moore.
Nevada Highway Department, Carson City, Hydrologic Report No 3, 1976. 17 p, 4 fig, 4 tab, 2 ref.

Descriptors: *Streamflow, *Peak discharge, *Estimating, *Small watersheds, *Nevada, Analytical techniques, Data collections, Hydrologic data, Elevation, Correlation analysis.
Identifiers: Empirical relations.

Streamflow records were used to define empirical relations between the 10-year peak discharge and 1,000-foot elevation zones for drainage basins less than 150 square miles in Nevada. The data indicated there were two hydrologically homogeneous regions, one for northern Nevada and one for southern Nevada, with respect to the 10-year peak discharge and basin area within elevation zones. Therefore, an empirical relation was developed for each of the two regions. Peak discharges from ungaged drainages in each region can be estimated on the basis of the derived relation for the region in which the basin lies. The standard error of estimate is approximately 22 percent in the north and 35 percent in the south. The method is particularly useful in Nevada which is a semi-arid region of large relief where the relation between peak discharges and total drainage area is not well defined. The method does not appear to give reliable results when large parts of the drainage basin lie on the valley floor. A graphical relation between the 10-year and 25-year peak discharges was developed to estimate the 25-year discharge. (Woodard-USGS)
W76-13080

DIGITAL MODELS OF A GLACIAL OUTWASH AQUIFER IN THE PEARL-SALLIE LAKES AREA, WEST-CENTRAL MINNESOTA,
Geological Survey, St. Paul, Minn.
For primary bibliographic entry see Field 2F.
W76-13082

A SIMPLIFIED SLOPE-AREA METHOD F ESTIMATING FLOOD DISCHARGES IN NA RAL CHANNELS,
Geological Survey, Reston, Va.
H. C. Riggs.
Journal of Research of the U S Geological Surv Vol 4, No 3, p 285-291, May-June 1976. 4 fig, 3 7 ref.

Descriptors: *Streamflow forecasting, *Fl discharge, *Channel flow, *Equations, Drain area, Slopes, Channel morphology, Flow sistance, Roughness(Hydraulic), Evaluation.

Discharge of a stream may be computed from slope of the water surface, the cross-secti area, and an estimate of channel roughness. T the slope-area method, is widely used to com flood peak discharges from high-water marks. liability of a computed discharge depends lar on the roughness coefficient, which must be mated. This paper shows that results of comp ble accuracy can be obtained from area and s alone in natural channels; a roughness coeffi is not needed because roughness and slope ar lated. The estimating equation and suggestion application of the simplified method are inclu (Woodard-USGS)
W76-13083

TECHNICAL MANUAL FOR ESTIMAT LOW-FLOW FREQUENCY CHA TERISTICS OF STREAMS IN SUSQUEHANNA RIVER BASIN,
Geological Survey, Harrisburg, Pa.
J. T. Armbruster.
Available from the National Technical Info tion Service, Springfield, VA 22161 as PB-255 $4.50 in paper copy, $3.00 in microfiche. W Resources Investigations 76-51, June 1976. 51 fig, 1 plate, 15 tab, 14 ref.

Descriptors: *Low flow, Streamflow, *Frequ analysis, *Regression analysis, *Regional a sis, River basins, Pennsylvania, New York, M land, Hydrology, Flow rates, Flow characteri
Identifiers: *Susquehanna River basin.

Procedures are presented for estimating low frequency characteristics for streams in Susquehanna River basin. The techniques c used at ungaged sites as well as sites where in cient data are available to make a reliable esti In this report streams are classified as maj minor streams. Major streams are those w drainage area is generally larger than 2,000 and in one of the following river reaches Chemung River between its mouth and the m of Tioga River; the Susquehanna River Marietta, Pa., to the mouth of the Chenango R the Juniata River from its mouth to the mou Raystown Branch Juniata River; and the Branch Susquehanna River from its mou Renova, Pa. Minor streams are all streams basin with drainage areas less than 2,000 sq m not on one of the major streams. Multiple-r sion techniques have been used to develop tions for estimating the 1-, 3-, 7-, 30-, and 18 duration low flows at recurrence intervals 20, 50 and 100 years for the annual series da the 1-, 3-, 7-, and 30-day duration low flows, same recurrence intervals, for six indi months, May through October, incl (Woodard-USGS)
W76-13086

THE DEVELOPMENT CRITERIA OF PRELIMINARY COASTAL PLAN,
University of Southern California. Los An School of Public Administration.
For primary bibliographic entry see Field 2L.
W76-13092

ROUGHT RESISTANCE OF BLUE GRAMA AS FECTED BY ATRAZINE AND N. FERTIL-ER,
ricultural Research Service, Fort Collins, Colo.
r primary bibliographic entry see Field 2I.
76-13122

NAMICS OF THE ROOT SYSTEM OF BLUE AMA,
VAR Aluminio Argentia, Cangallo. Area In-stigacion y Desarrollo.
r primary bibliographic entry see Field 2I.
6-13123

ANT SURVIVAL IN THE ARID SOUTHWEST YEARS AFTER SEEDING,
zona State Univ., Tempe.
. Judd, and L. W. Judd.
rnal of Range Managemet, Vol. 29, No. 3, p -251, May 1976. 2 fig, 1 tab, 5 ref.

criptors: *Range management, *Arid lands, izona, *Southwestern U.S., *Desert plants, ge grasses, Shrubs, Vegetation, Soil-water-t relationships, Vegetation establishment, eat grasses.
ntifiers: *Tonto National Forest(Arizona).

8 plant species seeded in 1945 in the Tonto Na-al Forest, Arizona, 13 survived for at least 20 rs and 7 for 30 years. Original planting included pecies of grass and grass-like plants and 7 of bs. Planting sites were in semidesert shrub or sland, chaparral, or pinyon-juniper areas, sites ed as representative of forest acreage and low fall situations. Plants which survived for at t 20 years are recommended for restoring eted rangelands in the Southwest, the species l depending on the site. Two wheatgrasses, testan bluestem, three lovegrasses, and rough odora did well where planted, especially with preparation and mulching. Those which sur-d a full 30 years were crested wheatgrass and ping lovegrass in the grassland, and Boer and mann lovegrassees, blue panicgrass, sand seed and menodora in the chaparral. No spe-survived in semidesert shrub or ponyn-juniper . Blue panicgrass and white tridens disap-ed some seasons but made periodic returns, ibly due to moisture relations. (Jahns-ona)
-13128

IARID RANGELAND TREATMENT AND FACE RUNOFF,
cultural Research Service, Las Cruces, N. Jornada Experimetal Range.
Tromble.
nal of Range Management, Vol. 29, No. 3, p 55, May 1976. 7 fig, 2 tab, 15 ref.

riptors: *Range management, *Soil conserva-*Arid lands, *Pitting(Corrosion), *Surface f, *Arizona, Soil surfaces, Vegetation ef-, Surface sealing, Storage, Water yield, Rain-unoff relationships.
ifiers: Walnut Gulch Experimental rshed(Ariz).

ts are reported of pitting and rootplowing on ce runoff at the Walnut Gulch Experimental rshed, a desert shrub range in southeastern na, and the time-dependent changes in soil ce characteristics caused by such practices. and gravel were negatively correlated with ce runoff, but when combined (erosion pave-caused a significant runoff reduction. Ex-soil caused runoff increases, while crown caused decreases. Runoff was significantly ated with percent bare soil at the 1% level; and gravel were negatively correlated with at the 1 to 5% levels, respectively. Litter ced no significant runoff reduction. The sur-ughness of rootplowed and pitted plots pro-detention storage for average-sized storms, and conservation treatments reduced runoff compared with control conditions. Rootplow treatment had the lowest yield for 1970 and 1971, but overgrazing increased runoff in 1972. Decreased vegetative cover due to heavy grazing or after rangeland conversion caused decreased rainfall interception and contributed to soil surface sealing. (Jahns-Arizona)
W76-13130

RANGE FERTILIZATION IN THE NORTHERN GREAT PLAINS,
Agricultural Research Service, Sidney, Mont. Northern Plains Soil and Water Research Center.
J. R. Wight.
Journal of Range Management, Vol 29, No 3, p 180-185, May 1976. 2 fig, 30 ref.

Descriptors: *Range management, *Fertilization, *Great Plains, *Nitrogen, *Crop production, Forages, Grazing, Water utilization, Soil-water-plant relationships, Forage palatability.
Identifiers: *Water-use efficiency.

Summaries are presented of forage and animal responses to range fertilization in the northern Great Plains where nutrient deficiency, especially of nitrogen, is a major growth-limiting factor. With proper management, applications of 30 to 50 lb N/acre/year can increase forage production 50 to 100%, with N-use efficiency of about 20 lb dry matter/lb N applied, or in grazing situations about 1 lb/lb N. Higher rates will produce more beef but less efficiently. Range fertilization can also improve water-use efficiency and forage quality and palatability. With applications of 50 lb N/acre/year or less, species composition changes gradually and can be controlled by application timing and by season and grazing intensity. Dramatic changes in species composition usually occur when applications exceed 150 lb N/acre. Because of the close relationship between water-use efficiency and forage yields, responses in both are similar. Fertilization can also increase the amount of precipitation available for plant use because the stimulated root system extracts more water from the profile. (Jahns-Arizona)
W76-13131

THE USE OF LINEAR PROGRAMMING TECHNIQUES FOR ESTIMATING THE BENEFITS FROM INCREASED ACCURACY OF WATER SUPPLY SYSTEMS,
Battelle Memorial Inst., Columbus, Ohio.
For primary bibliographic entry see Field 6A.
W76-13169

INTERDISCIPLINARY APPLICATIONS AND INTERPRETATION OF EREP DATA WITHIN THE SUSQUEHANNA RIVER BASIN,
Pennsylvania State Univ., University Park. Office for Remote Sensing of Earth Resources.
For primary bibliographic entry see Field 7B.
W76-13188

4B. Groundwater Management

FEASIBILITY OF MICROBIAL DECOMPOSITION OF ORGANIC WASTES UNDER CONDITIONS IN DEEP WELLS,
Oklahoma State Univ., Stillwater. Dept. of Microbiology.
For primary bibliographic entry see Field 5D.
W76-12688

GROUND-WATER BASIC DATA FOR DUNN COUNTY, NORTH DAKOTA.
Geological Survey, Bismarck, N. Dak.
For primary bibliographic entry see Field 7C.
W76-12786

ANNUAL SUMMARY OF GROUND-WATER CONDITIONS IN ARIZONA, SPRING 1974 TO SPRING 1975.
Geological Survey, Tucson, Ariz.
For primary bibliographic entry see Field 7C.
W76-12792

MAP SHOWING AVAILABILITY OF HYDROLOGIC DATA PUBLISHED BY THE U. S. ENVIRONMENTAL DATA SERVICE, AND BY THE U.S. GEOLOGICAL SURVEY AND COOPERATING AGENCIES, GREATER DENVER AREA, FRONT RANGE URBAN CORRIDOR, COLORADO.
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 7C.
W76-12794

WATER FOR INDUSTRIAL AND AGRICULTURAL DEVELOPMENT IN COAHOMA, DE SOTO, PANOLA, QUITMAN, TATE, AND TUNICA COUNTIES, MISSISSIPPI,
Geological Survey, Jackson, Miss.
For primary bibliographic entry see Field 3E.
W76-12798

FLUCTUATIONS OF GROUND-WATER LEVELS IN LEE COUNTY, FLORIDA, IN 1974,
Geological Survey, Tallahassee, Fla.
T. M. Missimer, and T. H. O'Donnell.
Open-file report FL-75008, 1976. 75 p, 40 fig, 7 tab, 4 ref.

Descriptors: *Observation wells, *Groundwater, *Water level fluctuations, Pumping, Groundwater recharge, Aquifers, Water table, Hydrologic data, *Florida.
Identifiers: Lee County(Fla).

Drought and high-water conditions occurred in Lee County, Fla., during the 1974 water year. In response to increased pumpage during the dry season, water levels in most observation wells tapping the water-table, sandstone, upper Hawthorn, and lower Hawthorn aquifers dipped to record-low levels. During the succeeding wet season, levels in most of the observation wells recovered to nearly normal levels. In some localities, water levels in wells tapping the sandstone aquifer have been declining over the years. Heavy pumping in west-central Lee County has resulted in a continuing decline of water levels in the upper Hawthorn aquifer. (Woodard-USGS)
W76-12801

A HYPOTHESIS OF ION FILTRATION IN A POTABLE-WATER AQUIFER SYSTEM,
Geological Survey, Austin, Tex.
W. W. Wood.
Ground Water, Vol 14, No 4, p 233-244, July-August 1976. 9 fig, 4 tab, 22 ref.

Descriptors: *Filtration, *Ions, *Ion transport, *Potable water, *Aquifer systems, Chemical reactions, Water chemistry, Geochemistry, Reverse osmosis, Sampling, Chemical analysis, Evaluation.
Identifiers: *Grand River basin(Mich), *Saginaw aquifer system.

Chemical analyses of major dissolved constituents in approximately 300 samples of ground water and 60 samples of stream water indicate that the process of ion filtration may control the distribution of some major ionic species in the water of the Saginaw aquifer system. This system, which is in the upper Grand River basin of the central part of the southern peninsula of Michigan, consists of sandstone, shale, coal, and limestone of the Saginaw Formation of Pennsylvanian age and overlying glacially deposited sand and clay of late Wisconsin age. The Saginaw Formation is recharged through the glacially deposited material; however, the concentrations of iron, calcium,

sulfate, and chloride are greater in water in the glacial deposits than in water in the underlying Saginaw Formation. It is hypothesized that shale beds in the Saginaw Formation act as ionic filters, allowing water with a lower dissolved-solids concentration to move through the shale to the sandstone aquifer. A concentration of ions greater than input value forms above the shale beds. Gravity provides the energy necessary to filter the water in a process of reverse osmosis. The similarity of this hydrogeologic system to other systems suggests that ion filtration may occur in many potable-water aquifers. (Woodard-USGS)
W76-12803

A SUMMARY OF THE GROUND-WATER HYDROLOGY OF THE AREA BETWEEN THE LAS VEGAS VALLEY AND THE AMARGOSA DESERT, NEVADA, WITH SPECIAL REFERENCE TO THE EFFECTS OF POSSIBLE NEW WITHDRAWALS OF GROUND WATER,
Geological Survey, Reston, Va.
I. J. Winograd.
Available from the National Technical Information Service, Springfield, VA 22161 as TEI 840, $5.00 in paper copy, $3.00 in microfiche. Report TEI-840, September 1963. 79 p, 2 fig, 56 ref, append.

Descriptors: *Groundwater resources, *Available water, *Water supply, *Hydrogeology, *Surveys, City planning, *Nevada, Data collections, Aquifer characteristics, Water yield, pumping, Water quality, Hydrologic budget.
Identifiers: *Nevada test site(Nev), Las Vegas Valley(Nev), Amargosa Desert(Nev).

Three general areas in the vicinity of Mercury, Nevada, are being considered by the Atomic Energy Commission for development of a town to facilitate operations at the Nevada Test Site. The hydrologic environment in which the townsite water supplies might be developed and the effects of pumping groundwater at each of several potential townsites upon other water supplies is summarized. Two extensive ground-water basins are involved in the townsite water-supply development. The Ash Meadows ground-water basin consists of several hydraulically connected valleys including Three Lakes and Indian Spring Valleys, Frenchman, Yucca, and Jackass Flats, the Amargosa Desert and Pahrump Valley. The Las Vegas ground-water basin consists primarily of the Las Vegas Valley. (Woodard-USGS)
W76-12807

HYDROLOGY OF LIMESTONE TERRANES, PROGRESS OF KNOWLEDGE ABOUT HYDROLOGY OF CARBONATE TERRANES,
Geological Survey of Alabama, University.
For primary bibliographic entry see Field 2F.
W76-12813

PUBLIC GROUNDWATER SUPPLIES IN LAKE COUNTY,
Illinois State Water Survey, Urbana.
D. M. Woller, and J. P. Gibb.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 256, $5.00 in paper copy, $3.00 in microfiche. ISWS Bulletin 60-20, 1976. 91 p, 2 fig.

Descriptors: *Water supply, *Illinois, *Groundwater resources, Unconsolidated aquifers, Well data, Gravels, Sand aquifers, Bedrock, Sandstones, Dolomite, Groundwater availability, Groundwater, Hydrology, Hydrogeology, Water sources, Water quality, Water wells, Municipal water, Water yield, Water properties, Hardness(Water), Chemical properties, Deep wells, Shallow wells, Geology, Aquifers.
Identifiers: *Lake County(Ill), Dissolved minerals, Water bearing formations.

All available information on production wells used for public water supplies in Lake County, Illinois, was presented. The definition of public water supply as contained in the Environmental Protection Act of 1970 was used to determine those water systems and wells to be included. The report included separate descriptions for 57 public water supply systems furnishing water to 23 municipalities, 32 subdivisions, 2 state parks, and 1 treatment plant in Lake County. These were preceded by brief summaries of the groundwater geology of the county and the development of groundwater sources for public use. Individual production wells for each supply were described in the order of their construction. The description for each well included the aquifer or aquifers tapped, date drilled, depth, driller, legal location, elevation in feet above mean sea level, log, construction features, yield, pumping equipment, and chemical analyses. (Humphreys-ISWS)
W76-12824

ONSET OF THERMOHALINE CONVECTION IN A CAVERNOUS AQUIFER,
Florida Univ., Gainesville. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2F.
W76-12835

ANALYSIS OF AQUIFER-AQUITARD FLOW,
Birmingham Univ. (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2F.
W76-12836

SOLID WASTES AND WATER QUALITY, (LITERATURE REVIEW),
Environmental Protection Agency, Washington, D. C. Wastewater Research Div.
For primary bibliographic entry see Field 5E.
W76-12933

GROUND-WATER QUALITY VARIATION IN PHELPS COUNTY, MISSOURI,
Forest Service (USDA), Rolla, Mo. Clark National Forest.
For primary bibliographic entry see Field 5B.
W76-12991

GROUNDWATER GEOPHYSICS IN SOUTH AFRICA,
Wellfield Services, Johannesburg (South Africa).
C. D. Mackie.
Journal of the Groundwater Association of South and South West Africa, Vol. 1, No. 3, p 7, 9-10, December, 1975. 4 fig.

Descriptors: *Geophysics, *Electrical studies, *Gravity studies, Africa, *Magnetic studies, *Seismic studies, Subsurface mapping, *Groundwater.
Identifiers: *Geophysical methods, South Africa.

The use of ground-water geophysical methods in prospecting for groundwater sources is comparatively new to South Africa. A great potential for its use exists not only in remote and arid areas, but also in the more densely populated areas where the need exists for increased supplies of potable water supplies. Several of the more basic methods now in use in South Africa are: gravity surveys, magnetic surveys, electrical resistivity surveys and seismic survey methods. These geophysical methods are suited predominatly to flat or undulating terraines where the over burden is relatively thin. The methods used in a specific situation are dictated by the physical properties of the rocks. Since some methods may be more economical than others the choice may be swayed in that respect. It is in the selection and application of the many different techniques that the role of the hydrogeophysicist becomes highly important. (Heiss-NWWA)
W76-13027

WATER REQUIRED TO DEVELOP GEOTH MAL ENERGY,
Texas University at Austin. Geothermal Studie
For primary bibliographic entry see Field 3E.
W76-13030

GROUND WATER MOVEMENT,
National Water Well Association, Worthing Ohio.
T. E. Gass.
Water Well Journal, Vol. 30, No. 9, Septem 1976. p 26-27, 1 fig.

Descriptors: *Groundwater movement, *W table, *Water yield, *Saturation, *Permeab *Aquifers, Evaporation, Transpiration, Tran sivity, Fractures, Fissures, Igneous rock, bonate rock, Sediments, Preci tion(Atmospheric).
Identifiers: Unconsolidated materials(Geolo Solution cavities.

Nearly all ground water originates as precipita As rain falls on an area, some will penetrate the ground. Of this water, some will event return to the atmosphere through evapotrans tion. The remainder will infiltrate the gr whether it consists of unconsolidated mat fractured rock, or solution cavities. Ground usually enters the aquifer within a radius miles from its point of withdrawal, exception rare. Ground water is not usually found in flo veins or underground rivers, but travels s between pores and in fractures of rocks. U non-artesian conditions, water moves down through the overlying rock. The larger, rounded, and better sorted the grain size in a the greater the permeability will be. As con tion increases with depth, the ability to tra water is retarded. When the overlying beds very low permeability, more of the water move horizontally from adjacent areas. Whe terconnected pore spaces in rocks are too sm permit significant water movement, fracture provide a route for ground water move between the surface and the water table. water table is the upper surface of the water rated underground rock strata which approxi ly parallels the overlying topography, and co the direction of ground water flow. Due to th that subsurface materials are not uniform and tures tend to occur in zones, water yield will from one locality to another. (Grober-NWW
W76-13031

ENGINEERED IRRIGATION WELLS.
The Cross Section, Vol. 23, No. 8, p 1,2,3,4 gust, 1976. 2 fig.

Descriptors: *Irrigation wells, *Water *Irrigation water, *Well screens, Pum Gravels, Aquifers, Aquifer characteristics.
Identifiers: *Engineered water wells, *G pack design, *Screen selection, *Well effici Pumping tests, Well development, Drilling Sand pumping, Aquifer depletion, Energy Pump maintenance, Ogallala formation, plains region.

The 'engineered well' in the past, has not be cepted for the installation of irrigation and types of wells systems in the high plains area word engineering tends to connote som complex and is more often considered an e sive operation. Decreasing well yields by a depletion, increasing energy and well har costs, and peak crop water demand; howeve making the engineered well more palatable irrigation farmer. Increased production, dep bility, higher efficiency, and lower energy an maintenance costs make the engineered we common sense alternative to high plains irrig Engineered wells are designed to fit the aqu the specific well site. Grael pack and screen tion are the prime factors in well design f high plains irrigation well. Proper deve

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niques and prolonged pumping test complete necessary engineered well installation process. engineered irrigation well will cost approxiely twice the ordinary irrigation well, but it will provide a useful life and sustained perance for many times longer than the half price . (Heiss-NWWA)
-13033

ICIENT AQUIFER DEVELOPMENT IS CESSARY TO EXPLOIT FULL YIELD TENTIAL,
lfield Services, Johannesburg (South Africa). of Drilling Technical Services Ltd.
primary bibliographic entry see Field 8B.
-13035

LL CUTTINGS ANALYSIS IN GROUNDTER RESOURCES EVALUATION,
ona Univ., Tucson. Dept. of Soils, Water and neering.
primary bibliographic entry see Field 8G.
-13036

ILABILITY OF GROUND WATER IN THE DLE CONNECTICUT RIVER BASIN, T-CENTRAL NEW HAMPSHIRE,
ogical Survey, Concord, N. H.
primary bibliographic entry see Field 7C.
-13062

ER RESOURCES DATA FOR SOUTH OLINA, WATER YEAR 1975.
gical Survey, Columbia, S. C.
rimary bibliographic entry see Field 7C.
13066

ER RESOURCES DATA FOR NORTH OLINA, WATER YEAR 1975.
gical Survey, Raleigh, N.C.
rimary bibliographic entry see Field 7C.
13067

-DIMENSIONAL STEADY-STATE DISPER- IN A SATURATED POROUS MEDIUM,
gical Survey, Menlo Park, Calif.
rimary bibliographic entry see Field 2F.
13071

LOGY AND GROUND-WATER URCES OF UNION COUNTY, NEW JER-

gical Survey, Trenton, N. J.
nickas.
-Resources Investigations 76-73, June 1976. 14 fig, 1 plate, 6 tab, 26 ref.

ptors: *Groundwater resources, *Water *Water yield, *Water quality, ogeology, Aquifer characteristics, rawal, Water supply, Groundwater ge, Specific capacity, Water level fluctua- Well data, Chemical analysis, Geology.
iers: *Union County(NJ).

d water in Union County, N. J., occurs in oids of unconsolidated stratified drift ts of Pleistocene age and in the joints and es of the Brunswick Formation and ng Basalt of Late Triassic age. Wells (6 or greater in diameter) in the stratified drift s yield from 180 to 690 gallons per minute Wells (6 inches or greater in diameter) in unswick Formation yield from 12 to 870 Withdrawals of ground water from all s in Union County for public supply are ed to average about 16.0 million gallons per gd) in 1968. The greatest quantity of ground s withdrawn from the Brunswick Formaout 11.6 mgd for public supply in 1968. The d drift aquifers yield substantial quantities of water--about 4.4 mgd in 1968--but the deposits are of limited extent. The Watchung Basalt is of minor importance as an aquifer in Union County. The quality of ground water from the stratified drift deposits is generally acceptable for most uses. Hardness ranges from 110 to 210 mg/liter. The pH ranges from 6.4 to 8.5. The quality of ground water from the Brunswick Formation is acceptable throughout the country for most uses. Hardness ranges from 71 to 1193 mg/liter. The pH ranges from 6.3 to 8.5. (Woodard-USGS)
W76-13072

WATER RESOURCES DATA FOR SOUTH DAKOTA, WATER YEAR 1975.
Geological Survey, Huron, S. Dak.
For primary bibliographic entry see Field 7C.
W76-13073

WATER RESOURCES DATA FOR IOWA, WATER YEAR 1975.
Geological Survey, Iowa City, Iowa.
For primary bibliographic entry see Field 7C.
W76-13074

WATER RESOURCES DATA FOR KENTUCKY, WATER YEAR 1975.
Geological Survey, Louisville, Ky.
For primary bibliographic entry see Field 7C.
W76-13075

GEOHYDROLOGY OF THE OKLAHOMA PANHANDLE, BEAVER, CIMARRON, AND TEXAS COUNTIES,
Geological Survey, Oklahoma City, Okla.
D. L. Hart, Jr., G. L. Hoffman, and R. L. Goemaat.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-254 028, $6.00 in paper copy, $3.00 in microfiche. Water-Resources Investigations 25-75, April 1976. 62 p, 15 fig, 10 plates, 6 tab, 38 ref.

Descriptors: *Hydrogeology, *Aquifer characteristics, *Irrigation, *Water quality, *Oklahoma, Water utilization, Groundwater resources, Withdrawal, Water yield, Water levels, Groundwater recharge, Groundwater availability, Chemical analysis, Maps.
Identifiers: *Oklahoma Panhandle.

The Ogallala aquifer is the principal source of ground water in the Oklahoma Panhandle. Based on an estimated average storage coefficient of 0.1, the quantity of water stored in the Ogallala aquifer was computed at approximately 50 million acre-feet. Local overdevelopment of this water resource has resulted in water-level declines of more than 40 feet from 1966 to 1972. The amount of ground water in storage has been reduced about 2 percent. Aquifer tests indicate that transmissivity ranges from 500 to 11,800 feet squared per day, the storage coefficient ranges from 0.002 to 0.11, and hydraulic conductivity ranges from 2.1 to 55 feet per day. Other aquifers that locally yield sufficient water for irrigation are the Dakota and Cheyenne Sandstone. Water levels in these aquifers have not shown the pronounced declines that have occurred in the Ogallala aquifer. Water in the Ogallala aquifer, Dakota Sandstone, and Cheyenne Sandstone Member generally has a dissolved-solids concentrations of less than 500 mg/liter. The dissolved-solids concentration in water from the Permian red beds generally exceeds 500 mg/liter and locally exceeds 2,000 mg/liter. (Woodard-USGS)
W76-13081

DIGITAL MODELS OF A GLACIAL OUTWASH AQUIFER IN THE PEARL-SALLIE LAKES AREA, WEST-CENTRAL MINNESOTA,
Geological Survey, St. Paul, Minn.
For primary bibliographic entry see Field 2F.
W76-13082

FACTORS AFFECTING DECLINING WATER LEVELS IN A SEWERED AREA OF NASSAU COUNTY, NEW YORK,
Geological Survey, Albany, N.Y.
For primary bibliographic entry see Field 5B.
W76-13084

FINITE-DIFFERENCE MODEL FOR AQUIFER SIMULATION IN TWO DIMENSIONS WITH RESULTS OF NUMERICAL EXPERIMENTS,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2F.
W76-13085

MORE WATER: ONE CITY'S PLAN,
Henningson, Durham and Richardson, Inc., Henderson, Tex.
For primary bibliographic entry see Field 6D.
W76-13097

VERTICAL TEMPERATURE AND CHEMICAL GRADIENTS IN GROUNDWATER IN THE TUCSON BASIN, ARIZONA,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
S. G. Mburu.
Master of Science Thesis, 1975. 93 p, 24 fig, 4 tab, 42 ref, 3 append.

Descriptors: *Groundwater, *Water temperature, *Water chemistry, *Water analysis, *Water wells, Aquifers, Water sampling, Electrical conductance, Hydrogen ion concentration, Well data, Drilling, Testing procedures, *Arizona.
Identifiers: *Tucson Basin(Ariz), Well bores.

Vertical temperature and chemical gradients studied in the groundwater of Tucson Basin indicated that temperature gradients can be used as an index of vertical mixing in well bores and thus as a guide for interpreting point samples for chemical analysis. A glass-probe termistor was used for measuring water temperature variations at different well bore depths. Techniques for plotting and analysis are described, and results given and graphed. Compared profiles of temperature, electrical conductivity, and bicarbonate and chloride contents indicated agreement with the assumed hypotheses of vertical flow and/or mixing in well bores for half of the sampled wells. Chemical gradient anomalies noted were partly due to incomplete chemical analysis; another possible cause is a general uniform chemical composition of aquifer water which does not change significantly with depth. Water chemistry was relatively uniform and had little variation with depth; pH studies revealed that water in most wells was in or close to equilibrium with respect to calcite. The water is mainly of sodium or calcium bicarbonate type in irrigation water class C2-S1. Applications of this water sampling technique are suggested. (Jahns-Arizona)
W76-13129

GEOTHERMAL ENERGY SYSTEM HEAT EXCHANGER AND CONTROL APPARATUS,
Sperry Rand Corp. New York. (Assignee).
K. E. Nichols.
U. S. Patent No. 3,961,866, 5 p, 5 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 947, No 2, p 690-691, June 8, 1976.

Descriptors: *Patents, *Geothermal studies, *Temperature, Thermal properties, Energy, *Energy transfer, *Heat exchangers, Injection, Injection wells, Steam turbines, Electrical power plants.

A geothermal energy transfer and utilization system extracts thermal energy stored in hot solute-bearing well water to generate super-heated steam from an injected flow of clean water; the super-heated steam is then used for driving a turbine-driven pump at the well bottom for pumping

the hot solute-bearing water at high pressure and always in liquid state to the earth's surface, where it is used by transfer of its heat content to a closed-loop vapor generator-turbine-alternator combination for the generation of electrical or other power. Cooled, clean water is regenerated by the surface-located system for re-injection into the deep well and the residual concentrated solute-bearing water is pumped back into the earth. Heat exchanger apparatus is located adjacent the turbine-driven pump for permitting steam exhausted by the turbine to cool that part of the re-injected water used as a hydraulic bearing lubricant. (Sinha-OEIS)
W76-13139

4C. Effects On Water Of Man's Non-Water Activities

MOVEMENTS AND GROWTH OF ARCTIC GRAYLING (THYMALLUS ARCTICUS) AND JUVENILE ARCTIC CHAR (SALVELINUS ALPINUS) IN A SMALL ARCTIC STREAM, ALASKA,
Aquatic Environments Ltd., Crossfield (Alberta).
For primary bibliographic entry see Field 5C.
W76-12756

SELECTED EFFECTS OF SUBURBAN DEVELOPMENT ON RUNOFF IN SOUTH-COASTAL, CALIFORNIA.
Geological Survey, Menlo Park, Calif.
T. J. Durbin.
In: Proceedings of National Symposium on Urban Hydrology and Sediment Control, held at University of Kentucky, Lexington, Kentucky, July 28-31, 1975: American Society of Civil Engineers, p 209-217, 1975. 8 fig, 7 tab, 9 ref.

Descriptors: *Urban hydrology, *Urbanization, *Urban runoff, *Model studies, *Flow characteristics, Watersheds(Basins), Streamflow, Flow rates, Peak discharge, Storm runoff, Evaluation, *California.
Identifiers: *South-coastal California.

The Stanford Watershed Model was used to simulate the effects of suburban development on the runoff from five drainage basins in the south-coastal area of California, a region with a semiarid climate and an average annual precipitation of 15 inches. The drainage basins ranged in size from 3.72 to 83.4 square miles. Using the model, synthetic records of runoff for each basin were generated to represent various degrees of suburban development. Examination of the synthetic records indicated that suburban development has the following effects on runoff: (1)Average annual runoff from a drainage basin with an effective impervious area of 10 percent of the drainage area is approximately 2 inches. The average annual runoff from a fully developed basin with an effective impervious area of 30 percent is approximately 4 inches. (2)Suburban development can increase the magnitude of peak discharge with a recurrence interval of 2 years by a factor of three to six. (3)Peak discharges that have recurrence intervals greater than a limiting value ranging from 50 to 200 years or more are little affected by suburban development. (Woodard-USGS)
W76-12810

URBAN HYDROLOGY FOR SMALL WATERSHEDS.
Soil Conservation Service, Washington, D. C. Engineering Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-244 531, $5.00 in paper copy, $3.00 in microfiche. Report SCS/ENG/TR-55, Technical releasee No. 55, Final report. January, 1975. 40 p, 12 tab, 17 fig, 5 append.

Descriptors: *Urban runoff, *Urban hydrology, *Runoff, *Floods, *Peak discharges, Surface runoff, *Urbanization, Vegetation, *Land use, Detention, *Retention, Graphical method, Water velocity, Watershed management, Reservoirs, Cisterns, Pondage, Infiltration, Storage.
Identifiers: Tabular method, SCS-TR-20 method, *Soil-cover-complex method.

Urbanized watersheds are covered by impervious structures such as roads, sidewalks, parking lots and houses. Transition from rural to urban land uses increases runoff volume and peak discharges. 'The amount of runoff from a storm depends on detention, infiltration, evapotranspiration, etc. and is related to soil type, type of vegetation, and amount of impervious cover.' With modifications, a soil-cover-complex method can be used to estimate runoff in urban areas. Peak rate of runoff is determined by 3 watershed parameters related to the velocity water flows from point of impact to watershed outlet: time of concentration, travel time and watershed lag. Decreasing peak discharges and dangers of flood require control methods dealing with storage availability, outflow rate and inflow rate. Advantages and disadvantages of measures for reducing or delaying runoff are given for cisterns, rooftop gardens, surface pond storage, ponding on roof, roof roughness, porous pavement, grass channels, vegetated strips, reservoir or detention basin, converted septic tank for storage, ground water recharge, high-delay grass and routing flow over lawns. Tabular, graphic and the SCS-TR-20 methods of determining peak flows are discussed. (Gentry-North Carolina)
W76-13044

THE IMPACT OF SUBURBANIZATION ON THE STREAM CHANNEL NETWORKS OF RALSTON CREEK AND SOUTH BRANCH, IOWA,
Iowa Univ., Iowa City. Dept. of Geography.
W. L. Graf.
Institute of Urban and Regional Research, University of Iowa, Iowa City, Technical Report No. 62, October 1975. 37 p, 8 fig, 3 tab, 16 ref, append.

Descriptors: *Drainage systems, *Urbanization, Streams, *Channels, *Peak discharge, Urban drainage, Water control, Water management(Applied), Channeling, Erosion, Deposition, Stream flow, *Iowa.
Identifiers: Bifurcation ratio, Arrangement index, Energyscape.

Drainage channels change their cross-sectional shape as a result of increased runoff from impervious suburban surfaces. Stream discharge represents energy responsible for environmental change or continuity. Channel networks spatially control hydrological activity, and thus also control distribution of energy, called the energyscape. This study is concerned with how the effect of artificial channels created during suburbanization alter the character of stream networks and influence flooding, erosion and deposition problems. Twenty-three variables are used to describe the effects suburbanization has on stream networks and stream flows. Principal variables are the number and length of exterior and interior links and channels, drainage area, drainage density, bifurcation ratio and arrangement index. It was concluded that network changes have contributed to flooding and consequences on fluvial landforms are expected. Future research will attempt to determine the relationship between network parameters and hydrologic parameters, and link network characteristics to flood characteristics by regression models. (Gentry-North Carolina)
W76-13051

FACTORS AFFECTING DECLINING WATER LEVELS IN A SEWERED AREA OF NASSAU COUNTY, NEW YORK,
Geological Survey, Albany, N.Y.
For primary bibliographic entry see Field 5B.
W76-13084

4D. Watershed Protection

THE SIMPLIFIED INTEGRAL MATHEMA CAL MODEL ON A SMALL LOW-LA CATCHMENT,
Technical Univ. of Warsaw (Poland). Inst. of vironmental Engineering.
For primary bibliographic entry see Field 2A.
W76-12831

EFFICIENCY OF NITROGEN, CARBON, A PHOSPHORUS RETENTION BY SM AGRICULTURAL RESERVOIRS,
Agricultural Research Service, Oxford, M Sedimentation Lab.
A. C. Gill, J. R. McHenry, and J. C. Ritchie
Journal of Environmental Quality, Vol. 5, No. 310-315, July-September 1976. 3 tab, 29 ref.

Descriptors: *Nitrogen compounds, *Phosph compounds, *Soil erosion, *Reservoir silting, bon, *Mississippi, Nitrogen, Analy techniques, Nitrates, Fertilizers, Nut removal, Phosphorus, Phosphates, Sedim Sedimentation, Reservoirs, Erosion, Impo ments, Soils, Watersheds(Basins), Trap effi cy.
Identifiers: *Nitrogen retention, *Carbon r tion, *Phosphorus retention, *Agricultural r voirs, *Soil nutrients, Universal soil loss equa Plant nutrients, Analytical procedures, Powe reservoir, Murphy reservoir, Smith reser Sediment retention.

Total N, total C, and readily available organic inorganic P contents, and particle-size dist tions were determined for samples of soils sediments collected from three agricul watersheds in north Mississippi. The total qu ties of N, P, C, and clay accumulated in the ments of each reservoir were calculated. T values were compared with those calculated soil losses estimated by using the Universal Loss Equation. The results showed conside variation between the percentages of nutrients and of soil particles retained in the r voirs. These reservoirs were highly effecti retaining eroded soil particles. However, the centages of soil nutrients retained in the rese sediments were less than the percentage retained soil particles. (Henley - ISWS)
W76-12983

VARIATION OF SUSPENDED SEDIM LOAD IN THE PALOUSE REGION OF NORTHWEST,
For primary bibliographic entry see Field 5G.
W76-13012

URBAN HYDROLOGY FOR SM WATERSHEDS.
Soil Conservation Service, Washington, D. C gineering Div.
For primary bibliographic entry see Field 4C.
W76-13044

PREIMPOUNDMENT WATER QUALITY RAYSTOWN BRANCH JUNIATA RIVER SIX TRIBUTARY STREAMS, SOUTH-TRAL PENNSYLVANIA,
Geological Survey, Harrisburg, Pa.
For primary bibliographic entry see Field 5A.
W76-13065

ESTIMATING PEAK DISCHARGES F SMALL DRAINAGES IN NEVADA ACC ING TO BASIN AREAS WITHIN ELEVA ZONES,
Geological Survey, Carson City, Nev.
For primary bibliographic entry see Field 4A.

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6-13080

OVERVIEW OF THE PRECIPITATION OCESSING SYSTEM AT THE SOUTHWEST TERSHED RESEARCH CENTER,
icultural Research Service, Tucson, Ariz. thwest Watershed Research Center.
primary bibliographic entry see Field 7C.
5-13132

OMORPHOLOGY AND CLIMATOLOGY OF D WATERSHEDS,
rew Univ., Jerusalem (Israel). Dept. of Geogy.
primary bibliographic entry see Field 2A.
5-13135

WATER QUALITY MANAGEMENT AND PROTECTION

Identification Of Pollutants

ASSESSMENT OF THE AIRBORNE EMISN OF SELECTED VIRUSES BY WASTETER TREATMENT FACILITIES,
igan Univ., Ann Arbor.
. Fannin.
lable from University Microfilms, Inc., Ann r, Mich., 48106. Order No. 76-10,297. Ph.D. is, 1976, 123 p.

riptors: *Waste water treatment, *Pollutant ification, *Activated sludge, *Viruses, kling filters, *Sewage, Treatment facilities, eriophage, Coliforms, *Air pollution.
ifiers: Animal viruses.

orne emission of viruses causing cytopathic t (CPE) in monkey kidney cells, coliform bac- and bacteriophages forming plaques on two erichia coli strains from trickling filter and ac-ed sludge waste water treatment plants were sed. Large volume air samplers, with an at-d recirculation apparatus, and Anderson lers were used for field sampling. Low levels icteriophage emissions were observed, but al viruses were not detected in aerosols. Conations of bacteriophages in sewage and their in air were compared. This ratio was then ared with sewage animal virus levels to esti- minimal airborne animal virus concentra- These estimates are less than the sensitivity procedures used. The susceptibility to infecnd density of the exposed downwind popula- should be considered in interpreting these ates' significance. The effects of meteorologconditions on airborne bacteriophage and rm bacteria recovery were observed. There significant correlations between relative hu- and bacteriophage recovery and between peed and coliform bacteria. There was an in- correlation between temperature and rm bacterial levels. Coliform bacteria do not appropriate as indicators of viral air pollusince their survival was lower than that of iophages. Bacteriophages probably would indicate this type of pollution. (Snyder-
2678

EY FOR RADIOACTIVITY IN A SWAMP,
nt de Nemours (E. I.) and Co., Aiken, S.C. nah River Plant.
imary bibliographic entry see Field 5C.
2689

Y OF FEDERAL WATER QUALITY TORING EFFICIENCY,
Control, Inc., Rockville, Md.
mary bibliographic entry see Field 5G.
2697

ENVIRONMENTAL TRACE MATERIALS: COMPUTER COUPLED RADIOACTIVATION ANALYSIS,
Environmental Research Lab., Corvallis, Oreg.
M. H. Feldman, D. E. Cawlfield, and K. V. Byram.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-251 105, $4.00 in paper copy, $3.00 in microfiche. Report EPA-600/3-75-015, December 1975, 42 p, 9 tab, 5 fig, 29 ref.

Descriptors: *Radioactivity techniques, *Trace elements, Tracers, Monitoring, Analytical techniques, Sludge, Sediments, Freshwater, *Pollutant identification.

Radiation methodologies for environmental trace materials research, in particular neutron activation or the equivalent x-ray spectroscopic methods, were found to be feasible at laboratories with access to suitable irradiation sources. Neutron activation analysis is desirable for environmental tracer experiments because of its sensitivity and its use of constituent tracer nuclides rather that the introduction of other tracers. Samples used in these studies ranged from sewage treatment plant sludges and marine sediments to fresh waters containing very low concentrations of molybdenum, and ores and fertilizers containing cadmium. Gold, silver, and chromium were found to be useful elements for sludge tracing. (Chilton-ORNL)
W76-12712

THERMAL EFFECTS ON THE ACCUMULATION OF ARSENIC IN GREEN SUNFISH, LEPOMIS CYANELLUS,
Texas Univ. at Austin. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W76-12731

TEMPERATURE RESPONSES OF A COCCOLITHOPHORID, CRICOSPHAERA CARTERAE, MEASURED IN A SIMPLE AND INEXPENSIVE THERMAL-GRADIENT DEVICE,
Duke Univ., Beaufort, N.C. Marine Lab.
W. F. Blankley, and R. A. Lewin.
Limnology and Oceanography, Vol. 21, No. 3, p 457-462, 1 fig, 13 ref.

Descriptors: *Laboratory equipment, *Temperature, Growth rates, Aquatic life, Apparatus, Thermal stress, Measurement, Instrumentation, *Pollutant identification.

A device is described which produces a range of temperatures along a gradient, is of simple construction and low cost. The gradient can be set to include temperatures between 5 and 45 C. Experiments performed with the device described identified the temperature range for growth of Cricosphaera carterae to be 10-26 C with a maximal growth rate at 20 C. (Chilton-ORNL)
W76-12764

MEASUREMENTS OF PHYSICAL PHENOMENA RELATED TO POWER PLANT WASTE HEAT DISCHARGES: LAKE MICHIGAN, 1973 AND 1974,
Argonne National Lab., Ill.
For primary bibliographic entry see Field 5B.
W76-12770

TRITIUM EFFLUENT CONTROL PROJECT, PROGRESS REPORT: JULY - SEPTEMBER 1975,
Mound Lab., Miamisburg, Ohio.
For primary bibliographic entry see Field 5D.
W76-12779

TRITIUM EFFLUENT CONTROL PROJECT, PROGRESS REPORT: JANUARY - MARCH 1975,
Mound Lab., Miamisburg, Ohio.
For primary bibliographic entry see Field 5D.
W76-12780

GROUND-WATER BASIC DATA FOR DUNN COUNTY, NORTH DAKOTA.
Geological Survey, Bismarck, N. Dak.
For primary bibliographic entry see Field 7C.
W76-12786

MAP SHOWING AVAILABILITY OF HYDROLOGIC DATA PUBLISHED BY THE U. S. ENVIRONMENTAL DATA SERVICE, AND BY THE U.S. GEOLOGICAL SURVEY AND COOPERATING AGENCIES, GREATER DENVER AREA, FRONT RANGE URBAN CORRIDOR, COLORADO.
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 7C.
W76-12794

GEOCHEMICAL CONTROLS ON LEAD CONCENTRATIONS IN STREAM WATER AND SEDIMENTS,
Geological Survey, Menlo Park, Calif.
J. D. Hem.
Geochimica et Cosmochimica Acta, Vol 40, p 599-609, 1976. 5 fig, 1 tab, 29 ref, append.

Descriptors: *Geochemistry, *Lead, *Streams, *Sediments, *Cation exchange, Mathematical models, Solubility, Heavy metals, *Path of pollutants, *Pollutant identification.

The equilibrium distribution of lead in solution and adsorbed on cation exchange sites in sediment theoretically may be calculated from equations representing selectivities of substrate for lead over H, Ca, and Na, and the stabilities of lead solute species. Such calculations include consideration of total concentrations of major ions, cation exchange capacity (CEC) of substrate, and pH, at values expected in various natural systems. Measurements of CEC and selectivity coefficients were made for synthetic halloysite, a finely divided amorphous 1:1 clay prepared by precipitation from a mixture of solutions of aluminum and silica. Where suspended sediment having the same properties is present in concentrations of 10-1,000 mg/liter at pH 6-8, more than 90% of the lead present can be adsorbed on sediment surfaces. The cation exchange behavior of lead and other minor cationic species in natural systems could be predicted by this type of model if enough other supporting information were available. Information of the type needed describing natural stream sediments, however, is presently inadequate for accurate predictions. (Woodard-USGS)
W76-12800

A PLAN FOR STUDY OF WATER AND ITS RELATION TO ECONOMIC DEVELOPMENT IN THE GREEN RIVER AND GREAT DIVIDE BASINS IN WYOMING,
Geological Survey, Cheyenne, Wyo.
For primary bibliographic entry see Field 6D.
W76-12805

DATA ON SELECTED LAKES IN WASHINGTON, PART 4,
Geological Survey, Tucson, Ariz.
For primary bibliographic entry see Field 7C.
W76-12808

ORGANICS IN DRINKING WATER. PART II. MASS SPECTRAL IDENTIFICATION DATA,
Ames Lab., Iowa.
G. A. Junk.
Available from the National Technical Information Service, Springfield, VA 22161 as IS-3672, $5.00 in paper copy, $3.00 in microfiche. Report IS-3672, July 1975, 80 p, 1 tab, 6 ref. W-7405-eng-82.

Descriptors: *Data collections, *Organic compounds, *Spectroscopy, Analytical techniques, *Pollutant identification.

The report is presented in a tabular form, ordered by increasing molecular weights. The table contains the 8 peak mass spectral data for 352 chemicals which have been identified in water. An additional 27 specific chemicals are also listed for which mass spectral data are not available. The table is intended for use by analytical chemists involved in the assay of water for trace organic constituents. (See also W76-03850) (Chilton-ORNL)
W76-12812

REMOTE SENSING STUDY OF MAUMEE RIVER EFFECTS ON LAKE ERIE,
National Aeronautics and Space Administration, Cleveland, Ohio. Lewis Research Center.
R. Svehla, C. Raquet, D. Shook, J. Salzman, and T. Coney.
Report No. NASA TM X-71780, July 1975. 26 p, 9 fig, 1 tab, 2 ref, 4 append.

Descriptors: *Remote sensing, *Water quality, *Ohio, *Pollutants, *Lake Erie, Aircraft, Ships, Infrared radiation, Sampling, On-site investigations, Suspended solids, Pollution, Water pollution sources, Path of pollutants, Measurement, Instrumentation, Pollutant identification.
Identifiers: *Maumee River(Ohio).

A preliminary report of a pilot study of the effects of river inputs on boundary waters was presented. The study was done in support of Task D of the Pollution from Land Use Activities Reference Group of the International Joint Commission. Task D has the responsibility to assess the significance of river inputs into receiving waters, dispersion of pollutants, and the effects on water quality. The objective of this effort was to assess the effects of the spring runoff of the Maumee River on Lake Erie by a combination of ship survey and remote sensing techniques. Imagery obtained from a multispectral scanner of the west basin of Lake Erie was presented and discussed. The imagery clearly showed the distribution of particulate throughout the covered area. This synoptic view, in addition to its qualitative value, can be very useful in selecting sampling stations for shipboard in situ measurements, and for extrapolating these quantitative results throughout the area of interest. (Sims-ISWS)
W76-12819

CHEMICAL DYNAMICS OF A POLLUTED WATERSHED, THE MERRIMACK RIVER IN NORTHERN NEW ENGLAND,
Massachusetts Inst. of Tech., Cambridge. Dept. of Earth and Planetary Sciences.
For primary bibliographic entry see Field 5B.
W76-12833

ATMOSPHERIC INPUT OF SOME CATIONS AND ANIONS TO FOREST ECOSYSTEMS IN NORTH CAROLINA AND TENNESSEE,
Forest Service (USDA), Franklin, N.C. Coweeta Hydrologic Lab.
For primary bibliographic entry see Field 2K.
W76-12838

FUNDAMENTAL STUDY ON THE POST TREATMENT OF RO PERMEATES FROM ARMY WASTEWATERS,
Illinois Univ. at Urbana-Champaign. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 5D.
W76-12851

REVIEW AND EVALUATION OF AVAILABLE TECHNIQUES FOR DETERIMINING PERSISTENCE AND ROUTES OF DEGRADATION OF CHEMICAL SUBSTANCES IN THE ENVIROMENT,
Syracuse Univ. Research Corp., N. Y. Life Sciences Div.
P. H. Howard, J. Saxena, P. R. Durkin, and L-T-, Ou.
Available from the National Techical Information Service, Springfield, VA 22161 as PB-243 825 $13.50 in paper copy, $3.00 in microfiche. Report EPA-560/5-75,006, May, 1975. 549 p, 54 fig, 48 tab, 745 ref.

Descriptors: *Waste water treatment, *Pollutant identification, *Sewage treatment, *Biological treatment, *Activated sludge, Sewerage, Analytical techniques, Biochemical oxygen demand.
Identifiers: Degradation testing.

Techniques used to study the persistence and breakdown of chemicals in the environment are reviewed, based on information from papers, books, review articles, and abstracting and computer services. A cost analysis of the techiques was also undertaken. The quality and quantity of the information varied considerably; pesticies and detergents in water and sewage were intensively studied. A relationship between environmental persistence and chemical structure is presented, with some theoretical grounds for such correlations. An attempt was made to categorize chemicals by suitable test methods. Precise criteria for evaluating environmental stability are lacking. There are three types of degradation: biodegradation, photochemical degradation, and chemical degradation. In contrast to the others, biodegradation generally yields completely mineralized end products. Biochemical oxygen demand (BOD) is frequently used for rapid screening. The river die-away test monitors the disappearance of the test chemical in natural water. Shake culture tests can use either mixed or pure cultures. Semicontinuous and miniature continuous models of activated sludge systems and models of tricking filter and anaerobic systems can measure biodegradability in sewage treatment systems. Determining biodegradation routes requires several methods, often involving cell-free extracts. Photochemical processes except in the atmosphere are poorly understood. Chemical degradation of some compounds should be studied in sterilized media. Because laboratory biodegradability studies are qualitative, they are relatively less important for metal compounds, many of whose reactions are reversible. (Snyder-FIRL)
W76-12865

A VIRUS-IN-WATER STUDY OF FINISHED WATER FROM SIX COMMUNITIES,
Health Effects Research Lab., Cincinnati, Ohio. Water Quality Div.
E. W. Akin, D. A. Brashear, and N. A. Clarke.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-246 042, $4.00 in paper copy, $3.00 in microfiche. Report EPA-600/1-75-003, September, 1975. 18 p, 9 tab, 4 ref.

Descriptors: *Pollutant identification, *Treatment facilities, *Analytical techniques, *Viruses, *Municipal water, Cities, Ohio, Indiana, Missouri, *Water treatment, Public health.

Six sites were chosen for a study of virus in water. They were Columbus, Ohio; Sidney, Ohio; Muncie, Indiana; Seymour, Indiana; Kansas City, Missouri, and St. Joseph, Missouri. Sites were selected on the basis of a treatment plant's use of surface source water with domestic contamination as indicated by high fecal coliform counts. An effort was also made to select sites using conventional procedures for flocculation or softening. Plants of various sizes, as indicated by output volumes, were chosen. The study was carried out to determine if the procedures and equipment presently available could detect human enteric viruses, and to test virus-sampling procedures and equipment in the field. A flow-through virus-adsorbent system was used. If viruses were pres in these waters, the numbers were below the tectable level of a sensitive viruses recov procedure. (Snyder-FIRL)
W76-12866

HANDBOOK FOR EVALUATING WATER BA TERIOLOGICAL LABORATORIES,
Municipal Environmental Research Lab., Cin nati, Ohio.
E. E. Geldreich.
Available from the National Technical Infor tion Service, Springfield, VA 22161 as PB-247 $7.50 in paper copy, $3.00 in microfiche. Re EPA-670/9-75-006, August, 1975. 206 p, 6 fig tab, 319 ref.

Descriptors: *Pollutant identification, *Analyt techniques, *Potable water, *Water sup *Laboratories, *Evaluation, Bacteria, Publ tions, Water quality standards, Personnel, collection.
Identifiers: *Bacteriology handbooks.

The material included is designed to provi comprehensive source of information reference for the evaluation of laboratorie volved in bacteriological testing of potable w supplies and their sources. A similar docu published by the Public Health Service in 1 based on experience in evaluating bacteriolo laboratories responsible for the examinatio water supplies, is updated and expanded. Mat and media preparation, equipment needs specifications, sample collection and hand bacteriological methodology, quality control siderations, laboratory management, and qualifications and responsibilities of the surve ficer are considered. Specific topics include n toring response, multiple tube coli procedures, and membrane filter coli procedures. The handbook is intended to assi the evaluation of the many aspects of the labo ry that are involved in attaining reliable data. ing of natural recreational waters, streams, ments and sludges as well as potable water sou is included. (Snyder-FIRL)
W76-12869

TECHNIQUES FOR OPTIMIZING A QUA POLE GC/MS/COMPUTER SYSTEM,
Environmental Research Lab., Athens, Ga.
M. H. Carter.
Report EPA-600/4-76-004, March, 1976. 33 fig, 6 ref, 2 append.

Descriptors: *Pollutant identification, *Analy techniques, *Optimization, Computers, Or compounds, Stability, Gas chromatography, spectrometry, Instrumentation.

Using experience gained during 4 years of an ing various types of organic pollutants, techn and procedures were developed to maintai stability and maximize the sensitivity of the nigan 1015-System 150 Gas Chromatograph/ Spectrometer/Computer (GC/MS/Comp System. Poor vacuum tube performance and temperature in the electronics chassis can instability. Appropriate maintenance and a ment techniques maximize sensitivity. propriate operator techniques are essenti maintaining sensitivity and stability. Me developed for increasing the utility of the dat lected by the GC/MS/Computer system in techniques for acquiring better data and fo tracting the most information from the dat have been acquired. Operator actions can s cantly improve the utility of the data. (Sn FIRL)
W76-12870

COMMENDED DESIGN OF SAMPLE IN-
KE SYSTEMS FOR AUTOMATIC INSTRU-
ENTATION,
vironmental Monitoring and Support Lab., Cin-
nati, Ohio.
P. Lauch.
ailable from the National Technical Informa-
Service, Springfield, VA 22161 as PB-248 733,
0 in paper copy, $3.00 in microfiche. Report
A-600/4-75-012, November, 1975. 29 p, 4 fig, 6
, 7 ref.

criptors: *Pollutant identification, *Pumps,
ste water(Pollution), *Water quality, *Intakes,
ter pollution, *Instrumentation, Monitoring,
sign criteria, *Automation, *Automatic con-

biochemical and mechanical reasons for sam-
change on intake systems were studied. Tests
e made on different types of pumping systems.
erimental data showed sample degradation
use of biological metabolism, cavitation, and
tion. Samples drawn from the river channel
usually representative of most of the water in
stream. High sample velocity through a
line of consistent cross section is required,
use sample degradation resulting from biolog-
metabolism of sludge and slime microbes
in the pipeline should be insignificant. Raw
r should flow directly from the river through a
p and to the instrumentation shelter. A posi-
pressure system with low residence time
mizes mechanical sample change due to
tation, reaeration, and damping. A system
gned for minimal biological sample degrada-
may not require automatic cleaning. Above a
in velocity for a specific line length and ex-
d internal surface, biological degradation is
nificant. Cursory results show that an op-
m velocity is attainable that would eliminate
need for automatic cleaning. Initial design
ld be aimed toward this optimum system. Ac-
to the intake strainer should be easy, because
dic manual cleaning is required. The design
consider system maintenance. All com-
nts must be accessible from the river bank
g the most adverse stream conditions.
ler-FIRL)
12871

GN AND TESTING OF A PROTOTYPE AU-
ATIC SEWER SAMPLING SYSTEM,
nd G Washington Analytical Services Center,
Rockville, Md.
Shelley.
rt EPA-600/2-76-006, March, 1976. 106 p, 27
tab, 12 ref, append.

iptors: *Pollutant identification, *Sewerage,
pling, *Sewage, *Water analysis, Water
y, Water pollution, Effluents, Storm drains,
ined sewers, Sanitary engineering, Waste
treatment.

haracteristics of storm and combined sewer
are briefly reviewed. These are difficult to
tely characterize in a water quality sense
the wide range of pollutants, the possible
variations within a cross-section of the
widely varying flow rates, the frequent
ce of significant bed load, and debris which
arm the sampler. The requirements for sam-
re discussed. Due to the large number of
varying parameters, a systems approach to
ing an automatic sampler is virtually manda-
he essential elements of such a system are
mpler, intake subsystem, the sample gather-
system, the sample transport subsystem,
mple storage subsystem, and the controls
wer subsystem. A new automatic sewer
g system was built using a modular ap-
, which allows the basic design implementa-
be tailored to suit various sampling and site
ments. It incorporates all solid-state elec-
, a clock for time correlation, high sample
and transport velocities, large peristaltic pumps and fluidic diverters to avoid moving parts in the sample train, the return of the first flow to waste, a fresh water purge and backflush before and after collecting each sample, multilevel sample intakes with non-intrusive mounting, and large sample capacity. The prototype performed well when field tested in a sewer. It was also tested with synthetic sewage under laboratory conditions and found capable of gathering reasonably representative samples over a range of flow characteristics. Four commercial samplers were tested side by side with the prototype under laboratory conditions and their results ranged from an overall understatement of pollutant loading by 25% to overstatements of 200%. (Snyder-FIRL)
W76-12872

ISOLATING ORGANIC WATER POLLUTANTS: XAD RESINS URETHANE FOAMS, SOLVENT EXTRACTION,
Environmental Protection Agency, Athens, Ga. Southeast Environmental Research Lab.
R. G. Webb.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-245 647, $4.00 in paper copy, $3.00 in microfiche. Report EPA-660/4-75-003, June, 1975. 21 p, 2 fig, 2 tab, 12 ref.

Descriptors: *Pollutant identification, *Analytical techniques, *Separation techniques, *Solvent extractions, *Resins, Adsorption, Chromatography, Drying, Gas chromatography, Organic wastes, Oily water, Pulp wastes, Dyes, *Isolation.
Identifiers: Kuderna-Danish evaporator.

Macroreticular resins (XAS-resins) and urethane foams were investigated as adsorbents for the isolation of organic pollutants from water. The procedures and reagents for solvent extraction were also examined for inefficiencies. XAD-2, 4, 7, and 8 and various mixtures effectively extracted a broad range of individual industrial pollutants and mixtures typical of paper mill waste waters, dissolved fuel oil, and textile dyes. Typical resin recovery efficiencies were 65 to 75% for individual compounds; direct chloroform extraction efficiency was 80%. These resins may be useful in long term or composite sampling. Polyurethane foams were not effective in extracting many compounds found in industrial effluents, although they function well for PCB's. Either chloroform or methylene chloride is generally recommended over diethyl ether or hexane as an extraction solvent. Drying of chloroform extracts before evaporation was shown to be unnecessary; drying with sodium sulfate or glass wool resulted in lower recoveries than direct concentration without drying. For typical industrial effluents, extract concentration to 10 ml with a Kuderna-Danish evaporator and to as low as 0.3 ml with a micro-Snyder column resulted in greater recovery of dissolved organics than did rotating evaporators and airstream-waterbath methods. Extraction with tetralin sometimes allows nonpolar low-boiling pollutants to be detected that are usually obscured in gas chromatographic analysis by the solvent peak. (Snyder-FIRL)
W76-12873

ENVIRONMENTAL SURVEY OF TWO INTERIM DUMPSITES--MIDDLE ATLANTIC BIGHT.
Environmental Protection Agency, Annapolis, Md. Annapolis Science Center.
For primary bibliographic entry see Field 5B.
W76-12875

MEASUREMENT AND PERSISTENCE OF CHLORINE RESIDUALS IN NATURAL WATERS,
North Carolina Univ. at Chapel Hill. Dept. of Environmental Sciences and Engineering.
CONF- 751096, In: Proceedings of the Conference on the Environmental Impact of Water Chlorination, held in Oak Ridge, Tennessee on October 22-24, 1975. p 43-71, 5 tab, 8 fig, 25 ref. DADA 17-72-C-2053.

Descriptors: *Water pollution treatment, *Waste water treatment, Water chemistry, Analytical techniques, *Chlorine, *Measurement, *Disinfection, Oxidation, *Pollutant identification, *Chlorination.

The distinction is made between good disinfectant compounds and those compounds of chlorine which are poorer as disinfectants. Hypochlorous acid is identified as a good disinfectant. Chlorine residual is identified as the concentration of all oxidizing agents produced by chlorination and remaining sometime afterward whether these oxidizing agents contain chlorine or not. The nature and persistence of chlorination products classed as chlorine residuals are discussed by type of compound. Present field, laboratory and continuous methods for determining free and combined chlorine residual are compared for specificity, reagent stability, accuracy and simplicity. A new analytical method specific for HOCl or NH2Cl in the presence of the poor disinfectants, hypochlorite, organic chloramines and other interferences is presented. (See also W76-12876) (Chilton-ORNL)
W76-12879

CHLORINATION OF ORGANICS IN COOLING WATERS AND PROCESS EFFLUENTS,
Oak Ridge National Lab., Tenn.
R. L. Jolley, G. Jones, W. W. Pitt, and J. E. Thompson.
In: Proceedings of the Conference on the Environmental Impact of Water Chlorination, October 22-24, 1975, Oak Ridge, Tennessee, Oak Ridge National Laboratory, p 115-152. 9 fig, 6 tab, 69 ref.

Descriptors: *Waste water treatment, *Pollutant identification, *Sewage treatment, *Analytical techniques, *Treatment facilities, Chlorination, Organic compounds, Cooling water, Effluents.

Available information concerning organic constituents in natural waters, including effluents from sewage treatment plants, is reviewed. Selected aspects of aqueous chlorination are discussed. Previous chlorination studies with sewage effluents and cooling water are summarized, and results from a recent study with a sample of cooling water are presented. Many water-soluble chlorine-containing organic compounds of low volatility were found in samples of chlorinated cooling waters from electric power-generating plants and chlorinated effluents from domestic sanitary sewage treatment plants. Both types of samples were chlorinated to milligram-per-liter chlorine concentrations in the laboratory under conditions similar to those used for treating cooling waters and disinfecting sewage effluents. High-pressure liquid chromatography was used to separate the chlorinated constituents from concentrates of the water samples. Chlorination yields (as Cl) of the chloro-organic compounds ranged from 0.5 to 3.1% of the chlorine dosage. The formation of chloro-organics and the reaction yields correlated with the chemical compositions of the samples. Several chloro-organics were quantified at the microgram-per-liter level in the domestic sewage effluents. A high degree of correspondence with respect to the elution positions of the separated constituents was revealed by comparison of the chromatograms of the chlorinated constituents in the cooling water samples with those of the sewage process effluent samples. (See also W76-12876) (Snyder-FIRL)
W76-12882

ANALYSIS OF NEW CHLORINATED ORGANIC COMPOUNDS FORMED BY

CHLORINATION OF MUNICIPAL WASTEWATER,
North Texas State Univ., Denton. Inst. of Applied Sciences.
W. H. Glaze, J. E. Henderson IV, and G. Smith.
In: Proceedings of the Conference on the Environmental Impact of Water Chlorination, October 22-24, 1975, Oak Ridge, Tennessee, Oak Ridge National Laboratory, p 153-175. 9 fig, 4 tab, 14 ref.

Descriptors: *Waste water treatment, *Pollutant identification, *Analytical techniques, *Organic compounds, *Chlorination, Waste water(Pollution), Municipal wastes, Chlorine, Texas, Spectrometry.
Identifiers: Chlorinated organic compounds.

Recent data on the formation of new chlorinated organics, particularly with the use of large doses of chlorine (1000 to 4000 mg/liter) are described. Two analytical techniques were used to investigate the effect of chlorination on secondary municipal waste water effluents. Total organic-bound chlorine (TOCl) is measured before and after chlorination by a microcoulometric procedure, whose development is reported. Extracts of the effluent before and after chlorination at various dosages are pyrolized and titrated in the Dohrmann halide analyzer. The TOCl results show a significant increase in the level of organic-bound chlorine in municipal waste water after chlorination, particularly using large doses of chlorine (2000 to 4000 ppm). The concentrates obtained by XAD-2 resin extractions of the effluents were studied by gas chromatography/mass spectrometry. The results confirm that chlorination causes the formation of many new chlorinated organics; the structures of over 50 have been identified. Although most of the compounds are aromatic halides, many are not derivatives of 'activated' aromatics but are simple derivatives such as chlorobenzenes, -toluenes, and -alkylbenzenes. Nonaromatic chlorides were also identified. The TOCl and GC/MS results indicate that doses of chlorine in the range of 2000 to 4000 ppm cause a very large increase in organic-chlorine content. GC/MS data on XAD extracts of Denton, Texas, drinking water are also reported. The occurrence of three iodine containing compounds, dichloroiodomethane, dibromoidomethane, and bromochloriodomethane, in the finished water is of particular interest. (See also W76-12876) (Snyder-FIRL)
W76-12883

CHEMISTRY OF HALOGENS IN SEAWATER,
Rosentiel School of Marine and Atmospheric Science, Miami, Fla.
J. H. Carpenter, and D. L. Macalady.
CONF-751096, In: Proceedings of the Conference on the Environmental Impact of Water Chlorination, held in Oak Ridge, Tennessee on October 22-24, 1975. p 177-193, 2 fig, 18 ref. EPA R 803893-01.

Descriptors: *Sea water, *Chlorination, Analytical techniques, Bromides, *Halogens, *Chlorine, Water chemistry, *Pollutant identification.

The limited information available for reactions that occur when chlorine is added to seawater is discussed. Data shows that the widely used procedure for estimating residual chlorine of seawater samples is misleading and that the identification of the chemical species formed is a prerequisite to designing proper analytical methods. Present information suggests that the bromide ion is oxidized and disproportionates to several oxidation states. Formation of brominated or mixed brominated-chlorinated organic compounds can be expected but the extent and speciation of such reactions remain to be determined. (See also W76-12876) (Chilton-ORNL)
W76-12884

CHLORINATED COMPOUNDS FOUND IN WASTE-TREATMENT EFFLUENTS AND THEIR CAPACITY TO BIOACCUMULATE,
Minnesota Univ., Duluth. Dept. of Chemistry.
H. L. Kopperman, D. W. Kuehl, and G. E. Glass.
In: Proceedings of the Conference on the Environmental Impact of Water Chlorination, October 22-24, 1975, Oak Ridge, Tennessee, Oak Ridge National Laboratory, p 327-345. 4 fig, 7 tab, 21 ref.

Descriptors: *Waste water treatment, *Pollutant identification, *Sewage treatment, *Analytical techniques, Sewage effluents, Disinfection, Minnows, Absorption, *Chlorination.
Identifiers: Chlorinated compounds, *Bioaccumulation.

To assess possible long-term environmental effects due to the formation of stable reaction products during disinfection processes, fathead minnows and water from the 9 month chronic toxicity tests at two waste water treatment plants were analyzed for chemical residues. Gel permeation chromatography was used for sample cleanup and gas chromatography/mass spectrometry for sample analysis. Di- and trichlorophenols, di- and trichlorobenzenes, and trichloroanisoles were detected at lower levels, if at all, in the fish from nondisinfected effluent exposures as compared to fish exposed to chlorinated effluent. All fish raised in the sewage effluent contained tetra- and pentachlorophenols, PCB's, DDT's, toxaphene components, chlordane, and nonachlor. Tribomoanisole was tentatively identified in fish that lived in waste water treated with bromine chloride. The incorporation of chlorine into compounds when it is used to disinfect effluents is an undesirable end result of effluent treatment in that compounds become more persistent and bioaccumulate to a greater extent. (See also W76-12876) (Snyder-FIRL)
W76-12891

MICROBIOLOGY - DETECTION, OCCURRENCE, AND REMOVAL OF VIRUSES, (LITERATURE REVIEW),
Environmental Research Center, Cincinnati, Ohio.
G. Berg.
Journal Water Pollution Control Federation, Vol. 48, No. 6, p 1410-1416, June, 1976. 44 ref.

Descriptors: *Viruses, *Microbiology, *Potable water, *Pollutant identification, *Waste water treatment, Diseases, Epidemiology, Adsorption, Filters, Temperature, Coagulation, Filtration, Bioindicators, Coliforms, Reviews, *Bibliographies.
Identifiers: Hepatitis, Poliovirus, Coliphages, *Literature reviews.

A literature review of papers dealing with the detection, occurrence, and removal of viruses from water is presented. General topics covered include: methods for recovering viruses from water, virus survival, water-related disease outbreaks, the removal of viruses by treatment processes, and indicators of viruses. Specific subjects discussed under the above general headings include: the effectiveness of adsorbent filters for recovering poliovirus 1 from large volumes of seeded finished drinking water, the inactivation of coliphage f2 viruses in waste water and drinking water at various temperatures, the recovery of an attenuated strain of poliovirus 3 from a finished water sample taken from a treatment plant, waterborne outbreaks of hepatitis, the use of coagulation with iron chloride and rapid sand filtration to remove poliovirus 1 in seeded synthetic water, and the usefulness of coliforms as indicators of viruses. (Kreager-FIRL)
W76-12896

STUDY ON THE EFFICIENCY OF FOUR PROCEDURES FOR ENUMERATING COLIFORMS IN WATER,
Canada Centre for Inland Waters, Burlington (Ontario).
B. J. Dutka, and S. E. Tobin
Canadian Journal of Microbiology, Vol. 22, No p 630-635, 1976. 5 tab, 8 ref.

Descriptors: *Pollutant identification, *Analyt techniques, *Sewerage, *Effluents, *Colifor Efficiencies, Estimating, Bacteria, Laborat tests.

Four coliform estimation procedures were c pared as to their ability to enumerate coliform b teria from sewage, effluent, and various fr waters in the lower Great Lakes Region Canada. The procedures included a most prob number (MPN) technique using lauryl tryp broth (LST) and brillant green bile 2% b (BGB), a membrane filtration (MF) techn using m Endo agar LES, an MPN technique u Parhad chemically defined synthetic med (PCDS) and BGB developed for Indian fr waters, and an MF(mC agar) technique develo for seawater. Within the survey area, maxim population estimates generally were achieved the MF procedure using m Endo agar LES. MPN procedure with the LST-BGB combina appears to provide the best estimates of sewage coliform densities. It estimates about ble the population of its closest competitor, PC BGB-MPN technique. Each procedure was se tive for different genera of the Entero teriaceae. (Snyder-FIRL)
W76-12897

LABORATORY EVALUATION OF POLYM IC FLOCCULANTS,
McMaster Univ., Hamilton (Ontario). Dept Chemical Engineering.
For primary bibliographic entry see Field 5D.
W76-12898

QUANTITATIVE DETERMINATION ASBESTOS FIBER CONCENTRATIONS,
Dow Chemical Co., Midland, Mich.
D. R. Beaman, and D. M. File.
Analytical Chemistry, Vol. 48, No. 1, p 101 January, 1976. 7 fig, 3 tab, 22 ref.

Descriptors: *Asbestos, *Analytical techni *Pollutant identification, *Measurement, Elec microscopy, Water analysis, Methodology.
Identifiers: *Asbestos fibers, Chrysotile fi Amphibole fibers, Selected area electron dif tion, Energy dispersive spectrometer, Vacuu tration.

A method of measuring the concentratio asbestos fibers in filterable liquids and matrices is presented. In the described me fiber identification is based on the almost s taneous determination of the morphology, ele tal composition and crystal structure. This i complished by using a transmission ele microscope (TEM) equipped with selected electron diffraction (SAED) and an energy di sive spectrometer (EDS). Sample preparatio strumentation and procedure are discussed. V samples underwent vacuum filtration. Ex ments were conducted to determine how fiber was lost during sample preparation. mean loss of amphibole fiber for eight diff tests was 45% and the mean loss for chry fiber after eleven different tests was Chrysotile is less prone to wash off than phibole. Results showed that 40 to 100% c chrysotile fibers in water samples have distin tubular morphology. Identifiable SAED pa were observed for about 30% of the chry fibers and 60% of the amphibole fibers. By a ing corrections for SAED ambiguities and l during sample preparation and by makin lowances for the dependence of fiber compo on fiber size, it was possible to measure asb fiber concentrations with a precision of pl minus 30%. A classification scheme developed to establish maximum and min limits of fiber concentration for each sa (Pinto-FIRL)

V76-12899

ASA TO TEST NEW TECHNIQUES FOR ON-TREAM WATER MONITORING.
nstrumentation Technology, Vol. 23, No. 6, p 17, ne, 1976.

escriptors: *Waste water treatment, *Pollutant entification, *Sewage treatment, *Analytical chniques, *Monitoring, Coliforms, Water types, utomation, Evaluation.

echniques developed by the National Aeronau-cs and Space Administration (NASA) to detect icroorganisms in water systems on manned acecraft are being adapted to detect harmful cteria in the treated water of cities. The new ocesses are incorporated in an Automated Water onitoring System to be evaluated for one year in operation with the Gulf Coast Waste Disposal uthority, which is responsible for sewage treat-ent in three southeast Texas countries. The elec-nic system will monitor treated water for such mponents as dissolved oxygen, total oxygen de-nd, total organic carbon, bacteria, chlorides, sidual chlorine, ammonia, nitrate, total nitrogen, dium, water temperature, turbidity, conductivi-, hardness, and acidity or alkalinity. The system n be adapted to process data from up to 40 water nsors. In the initial evaluation, 24 sensors will be ed. By adding chemicals which cause bacteria to liate light, researchers have developed a sensor t gives total bacteria count directly. A device s also been developed that can detect human d nonhuman fecal coliform bacteria in a few hr. e monitoring system eventually will include an trument to rapidly and automatically detect or-nic chemicals known to produce cancer in lab mals. A gas chromatograph technique, ginally developed to extract small quantities of anic materials from the atmospheres of other nets, is being adapted to concentrate these emicals for rapid analysis. Research is also in gress on a technique, using fluorescent dyes, igned as a method of detecting life in space, ich might be applied to the detection of viruses vater. (Snyder-FIRL)
6-12900

NTINUOUS MONITORING, AUTOMATED ALYSIS, AND SAMPLING PROCEDURES, TERATURE REVIEW),
rida Univ., Gainesville. Dept. of Environmen-Engineering Sciences.
.. Brezonik, and N. E. Carriker.
rnal Water Pollution Control Federation, Vol. No. 6, p 1077-1086, June, 1976. 87 ref.

criptors: *Analytical methods, *Pollutant ntification, *Sampling, *Bioassay, olorimetry, Turbidity, Chemical oxygen de-d, Chlorides, Sulfides, Organic compounds, ganic compounds, Carbon, Fish, Toxicity, nitoring, Potable water, Instrumentation, ctrochemistry, Chlorine, Reviews, bliographies.
ntifiers: Potentiometric methods, Amperomet-nethods, Spectrometric methods, *Literature ews.

eview of literature dealing with continuous r quality monitoring, automated analysis, and pling procedures is presented. General topics ered include: the use of electrometric and trometric methods for analyzing inorganic tances, techniques for measuring oxygen de-d and organic matter and for performing ssays and methods and instrumentation for cting and preserving water samples. Exam-of specific topics discussed under the above ral heading include: the use of amperometric ods for residual chlorine determination, the of potentiometric electrodes for monitoring ns and anions in industrial waste waters, imetric methods for chloride and sulfide minations, turbidity monitoring with a dual beam optical transmissometer, semiautomated procedures for chemical oxygen demand, automated flow-through procedures for measuring dissolved organic carbon in natural waters, device for monitoring toxic substances when fish are used as the assay organisms, evaluation of commercially available waste water samplers, and sampling and preservation procedures for nitrogen species in drinking water supplies. (Kreager-FIRL)
W76-12902

AIRBORNE COLIPHAGES FROM WASTE-WATER TREATMENT FACILITIES,
Michigan Univ., Ann Arbor. School of Public Health.
K. F. Fannin, J. C. Spendlove, K. W. Cochran, and J. J. Gannon.
Applied and Environmental Microbiology, Vol. 31, No. 5, p 705-710, May, 1976. 6 tab, 30 ref.

Descriptors: *Air pollution, *Viruses, *Waste water treatment, *Treatment facilities, Activated sludge, Trickling filters, Coliforms, Aerosols, Bacteria, Microorganisms, Analytical techniques, Pollutant identification.
Identifiers: *Coliphages(Air borne).

Waste water treatment plant emissions of airborne coliphages that form plaques on two strains of Escherichia coli were investigated. Two activated sludge and two trickling filter plants were investigated using large volume air samplers with recirculation devices. Coliphages were enumerated by a most probable number procedure. Average coliphage levels in the airborne emissions of trickling filter beds and activated sludge units were 0.284 and 0.302/cu m, respectively; sewage liquor concentrations from the above sources were 448,000 and 2.94 million plaque-forming units/liter, respectively, depending on the Escherichia coli host used for the assay. The isolation of low levels of coliphages from the airborne emissions of waste water treatment plants demonstrates that these viruses can survive natural aerosolization and may be recovered with the procedures used. (Kreager-FIRL)
W76-12921

FATE OF METALS IN WASTEWATER DISCHARGE TO OCEAN,
CDM, Inc., Pasadena, Calif.
For primary bibliographic entry see Field 5B.
W76-12927

SANITARY LANDFILL LEACHATES AND THEIR TREATMENT,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W76-12930

POLLUTANT AEROSOL DEPOSITION INTO SOUTHERN LAKE MICHIGAN,
Illinois State Water Survey, Urbana. Atmospheric Sciences Section.
For primary bibliographic entry see Field 5B.
W76-12935

ULTRASONIC REMOVAL OF EPILITHIC ALGAE IN A BARCLAMP SAMPLER,
Ichthyological Associates, Inc., Berwick Pa.
W. F. Gale.
Journal of Phycology, Vol. 11, No. 4, p. 472-473, 1975. 1 fig., 1 tab., 1 ref.

Descriptors: *Periphyton, *Algae, *Sampling, *Rocks, *Bottom sampling, Methodology, Design, Automation, Non-destructive tests, *Ultrasonics, Standing crops, Pollutant identification.
Identifiers: Bar-clamp sampler, *Epilithic algae, Ultrasonic algae collection.

Standing crop estimates of epilithic algae are difficult to determine because it is not possible to collect quantitative samples of natural substrates in lakes and deep rivers. A bar-clamp sampler with an attached collecting cup is described which permits quantitative sampling of epilithic algae on stones 4-50 cm in diameter or larger or on artificial substrates in shallow or deep water. It is designed for SCUBA divers to use in turbid rivers too deep and swift for wading, but can be used in othe habitats. It delimits the sampling area and encloses it, so algal cells cannot enter or be lost when handling or transporting stones and holds water in the sampling area, which prevent drying, helps dislodge materials during cleaning, and carries dislodged cells to collection jars. Ultrasonic vibration remove cells from stones (up to 62% of the total) missed by scraping and brushing. The method has been used for a year to remove algae from stones collected in the Susquehanna River. It has held up well in the field, is easy for a diver wearing thick neoprene mittens to manipulate, and facilitates cleaning by stabilizing the stone and rigidly maintaining the sampling area. Its design, construction, and application are described. (Buchanan-Davidson--Wisconsin).
W76-12939

THE OCCURRENCE OF ORGANIC MICROPOLLUTANTS IN THE RIVER RHINE AND THE RIVER MAAS IN 1974,
Netherlands Waterworks, Rijswijk. Testing and Research Inst.
A. P. Meijers, and R. C. van der Leer.
Water Research, Vol. 10, No. 7, p 597-604, 1976. 10 fig, 8 tab.

Descriptors: *Pollutant identification, *Organic wastes, *Water quality, Organic compounds, *Pesticides, Surface waters, Chlorinated hydrocarbon pesticides, Oil wastes, Water properties, Water pollution sources, Chemical wastes, Analytical techniques, Gas chromatography, Analysis, Mass spectrometry, Water pollution, Chemistry, Instrumentation.
Identifiers: *Organic micropollutants, *Rhine River, *Maas River, Pollution investigation, Organic pollutants, *Waal River, Lindane, Chlorobenzene, Nitrobenzene, Analytical procedures, Organic groups, Infrared spectrometry, Aromatic bases, Oxygenated substances, Aromatic hydrocarbons.

For several years KIWA (Testing and Research Institute of the Netherlands Waterworks) has investigated the pollution of the river Rhine and river Maas for specific organic groups. A quantity of 20 1 of water was extracted weekly with hexane, and the extract divided into several groups. The extracts were analyzed by gas chromatography and mass-spectrometry. The results of these investigations during 1974 were summarized and showed that the river Rhine is heavily polluted by oil, a number of aromatics and aromatic bases, and a number of oxygenated substances. It was also shown that the river Maas, however, is much less polluted by these substances with the exception of oil. (Henley-ISWS)
W76-12988

ATMOSPHERIC AEROSOLS: A LITERATURE SUMMARY OF THEIR PHYSICAL CHARACTERISTICS AND CHEMICAL COMPOSITION,
Old Dominion Univ., Norfolk, Va. School of Sciences.
F. S. Harris, Jr.
Report NASA CR-2626, January 1976. 43 p, 1 tab, 199 ref. NGR 47-003-068.

Descriptors: *Bibliographies, *Air pollution, *Aerosols, *Pollutants, *Atmosphere, Pollutant identification, Analytical techniques, Physical properties, Particle size, Spatial distribution, Temporal distribution, Salts, Organic compounds, Elements(Chemical), Saline water intrusion.

This report contained a summary of 199 recent (1968-1975) references on the characterization of atmospheric aerosols with respect to their composition, sources, size distribution, and time changes, and with particular reference to the chemical elements measured by modern techniques, especially activation analysis. The literature review was made as a guide to the characterization of aerosols which would be useful in air quality measurements by NASA-LaRC and Old Dominion University in cooperation with Region VI, Virginia State Air Pollution Control Board. The purpose of the joint measurements is to learn what types of variables it would be useful to determine in addition to the usual mass loading and meteorological factors. This examination of recent literature, particularly with respect to the results of elemental analysis and other variables of interest, may be of use to others working in this field. For the varied experimental conditions and techniques employed, reference must be made to the original articles. No attempt was made to explain differences which resulted from different conditions and techniques. (Humphreys-ISWS)
W76-12996

SAMPLERS FOR MONITORING RUNOFF WATERS,
Kansas State Univ., Manhattan. Dept. of Agricultural Engineering.
H. L. Manges, and C. C. Nixon.
Presented at the 1975 Winter Meeting of the American Society of the Agricultural Engineers, December 15-18, 1975, Chicago, Illinois. 10 p, 4 fig, 9 ref. ASAE Paper 75-2562.

Descriptors: *Runoff, *Sampling, *Water sampling, Water pollution sources, Water pollution control, *Pollutant identification, *Monitoring.

A sampler is badly needed for collecting a proportional sample of runoff water for laboratory analysis. Pollutant load in runoff would be calculated from sample volume and pollutant concentration measurements. A sampler was designed and built which divided flow with short tubes. In laboratory tests, sampling ratio became constant after decreasing with increasing flow rates for unsubmerged flow and was constant for submerged flow. Sampling ratio was quite variable during field testing because of debris clogging the reservoir below the short tubes. A sampler using orifices surrounded by short tubes in place of the short tubes alone for dividing flow had a slightly better sampling ratio for unsubmerged flow and a constant sampling ratio for submerged flow. (Skogerboe - Colorado State)
W76-13006

PHYSICAL-CHEMICAL COMPOSITION OF ERODED SOIL,
Purdue Univ., Lafayette, Ind. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2J.
W76-13010

PREIMPOUNDMENT WATER QUALITY OF RAYSTOWN BRANCH JUNIATA RIVER AND SIX TRIBUTARY STREAMS, SOUTH-CENTRAL PENNSYLVANIA,
Geological Survey, Harrisburg, Pa.
D. R. Williams.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A027 387, $4.00 in paper copy, $3.00 in microfiche. Water-Resources Investigations 76-57, June 1976. 23 p, 5 fig, 5 tab, 5 ref.

Descriptors: *Water quality, *Baseline studies, *Pre-impoundment, *Streams, *Reservoirs, Sampling, Data collections, Chemical analysis, Water analysis, Soil analysis, Physical properties, Nutrients, Coliforms, Evaluation, *Pennsylvania, Pollutant identification.
Identifiers: *Juniata River watershed(Penn), Raystown Branch(Penn).

The Raystown Branch Juniata River watershed, which is the main water source for Raystown Lake, is a 960-square-mile drainage basin in south-central Pennsylvania. Preimpoundment water-quality data were collected on the Raystown Branch and six tributary streams in the basin. Specific conductance values varied inversely with water discharge. The pH values were extremely low only at the Shoup Run site. Dissolved oxygen concentrations observed at all sites indicated a relatively high oxygen saturation level throughout the year. Seasonal variations in nitrate-N and orthophosphate-P levels were measured at the main inflow station, Saxton, Pa. The highest concentrations of nitrate-N and orthophosphate-P occurred in the winter and spring months and the lowest concentrations were measured during the summer and fall. Bacteriological data indicated no excessive amounts of fecal matter present at the inflows. Soil samples collected at four sites in the impoundment area were predominantly of the Barbour, Philo, and Basher series, which are considered to be highly fertile soils with silt-loam and sandy-loam textures. Morphological features of the lake basin and low nutrient levels at the inflows should prevent excessive weed growth around the lake perimeter. (Woodard-USGS)
W76-13065

WATER RESOURCES DATA FOR SOUTH CAROLINA, WATER YEAR 1975.
Geological Survey, Columbia, S. C.
For primary bibliographic entry see Field 7C.
W76-13066

WATER RESOURCES DATA FOR NORTH CAROLINA, WATER YEAR 1975.
Geological Survey, Raleigh, N.C.
For primary bibliographic entry see Field 7C.
W76-13067

OCCURRENCE OF ARSENIC IN THE DRY CREEK BASIN, SONOMA COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
R. F. Middelburg.
Available from the National Technical Information Service, Springfield, Va 22161 as ADA-028 020, $3.50 in paper copy, $3.00 in microfiche. Water-Resources Investigations 76-30, May 1976. 17 p, 5 fig, 2 tab, 13 ref.

Descriptors: *Water pollution sources, *Arsenic compounds, *Water quality, *Pre-impoundment, *Baseline studies, *California, Lakes, Springs, Hot springs, Watershed management, Water chemistry, *Pollutant identification.
Identifiers: Sonoma County(Calif), *Dry Creek basin, *Arsenic.

An arsenic reconnaissance study was made from August through November 1974 in the Dry Creek basin in northern California where the U.S. Army Corps of Engineers proposes to construct Warm Springs Dam. The purpose was to determine the extent of any potential arsenic problems that may affect Lake Sonoma which would form behind the dam. Samples of sediment, water, and biota were collected and analyzed for arsenic content. Results indicate that arsenic presents a potential problem only in the Little Warm Springs Creek area where samples of geothermal water contained 140 micrograms of arsenic per liter of water. However, the contribution of arsenic to the lake will be minimal because discharge of the geothermal water in the area is estimated to be only about 0.01 cubic foot per second (0.0003 cubic meter per second). Analyses of limited numbers of biota samples indicated that there is no biomagnification of arsenic through the food chain. Concentrations of arsenic in biota were similar both in samples collected from water containing high levels of arsenic and those collected from water with low arsenic content. (Woodard-USGS)
W76-13068

EPIFAUNA AT JACKSON POINT IN POR VALDEZ, ALASKA, DECEMBER 197 THROUGH SEPTEMBER 1972,
Geological Survey, Anchorage, Alaska.
J. W. Nauman, and D. R. Kernodle
Journal of Research of the U S Geological Surve Vol 4, No 3, p 299-304, May-June 1976. 4 fig, 4 ta 17 ref.

Descriptors: *Path of pollutants, *Water qualit *Alaska, *Oil industry, *Benthic fauna, Estuarie Coasts, Analytical techniques, Biological comm nities, Sampling, Baseline studies, Pollut identification.
Identifiers: *Epifauna, *Port Valdez(Alaska).

Epifaunal organisms are abundant in estuaries a coastal waters. Because most epifaunal organis are immobile and adapted to specific condition but restricted in their distribution by physical e vironmental conditions, they can be used to dete changes in water quality. A biological sampli program at Jackson Point (proposed oil termi site) in Port Valdez, Alaska, was begun December 1970. Sixteen artificial substrate sa plers (8 multiplate and 8 rock-filled baskets w net liners) were retrieved after 2 to 4 months' e posure. The two sampler types collected appro mately the same major groups of organisms; ho ever, the multiplate samplers collected an avera of 1.6 times more organisms than the basket sa plers. The basket sampler, on the other hand, c lected three more species per sample than those the multiplate samplers. Diversity values w lower during 1972, except for the spring samp Seasonal diversity varied from a low of 0.36 in t summer of 1972 to a high of 3.99 in the fall of 19 (Woodard-USGS)
W76-13070

GEOLOGY AND GROUND-WAT RESOURCES OF UNION COUNTY, NEW JE SEY,
Geological Survey, Trenton, N. J.
For primary bibliographic entry see Field 4B.
W76-13072

WATER RESOURCES DATA FOR SOU DAKOTA, WATER YEAR 1975.
Geological Survey, Huron, S. Dak.
For primary bibliographic entry see Field 7C.
W76-13073

WATER RESOURCES DATA FOR IOW WATER YEAR 1975.
Geological Survey, Iowa City, Iowa.
For primary bibliographic entry see Field 7C.
W76-13074

WATER RESOURCES DATA FOR KENTUCK WATER YEAR 1975.
Geological Survey, Louisville, Ky.
For primary bibliographic entry see Field 7C.
W76-13075

GEOHYDROLOGY OF THE OKLAHOMA PA HANDLE, BEAVER, CIMARRON, AND TEX COUNTIES,
Geological Survey, Oklahoma City, Okla.
For primary bibliographic entry see Field 4B.
W76-13081

SHIPBOARD OIL-IN-WATER CONTENT MO TOR BASED ON SMALL ANGLE FORWA LIGHT SCATTERING,
General Electric Co., Philadelphia, Pa. Re-en and Environmental Systems Div.
For primary bibliographic entry see Field 5G.
W76-13094

HANGES IN THE REACTIVITY OF THE HOTOSYNTHETIC APPARATUS IN ETEROTROPHIC AGEING CULTURES OF CENEDESMUS OBLIQUUS. I. CHANGES IN HE PHOTOCHEMICAL ACTIVITIES,
larburg Univ. (West Germany). Botanisches Initut.
or primary bibliographic entry see Field 5C.
/76-13109

HANGES IN THE REACTIVITY OF THE HOTOSYNTHETIC APPARATUS IN ETEROTROPHIC AGEING CULTURES OF CENEDESMUS OBLIQUUS. II. CHANGES IN LTRASTRUCTURE AND PIGMENT COMOSITION,
larburg Univ. (West Germany). Botanisches Initut.
or primary bibliographic entry see Field 5C.
/76-13110

HANGES IN THE REACTIVITY OF THE HOTOSYNTHETIC APPARATUS IN ETEROTROPHIC AGEING CULTURES OF CENEDESMUS OBLIQUUS. III. RECOVERY F THE PHOTOSYNTHETIC CAPACITY IN GED CELLS,
larburg Univ. (West Germany). Botanisches Initut.
or primary bibliographic entry see Field 5C.
/76-13111

SIMPLIFIED METHOD FOR THE BIOLOGIAL ASSESSMENT OF THE QUALITY OF RESH AND SLIGHTLY BRACKISH WATER,
N. Dresscher, and H. van der Mark.
ydrobiologia, Vol. 48, No. 3, p. 199-201, 1976. 1 g., 1 tab., 7 ref.

escriptors: *Biological communities, *Analytical chniques, *Biochemical oxygen demand, rackish water, Freshwater, Decomposing ornic matter, Trophic level, *Pollutant identificaon.
entifiers: *Saprobic index.

simple method is described to biologically ass saprobic water quality a measure of the phase which the conversion process of biologically composable substances takes place. The saproc degree may be determined by examining the oportion between number of species of single oups of microorganisms; that is, the extent of llution may manifest itself biologically in nuerical proportion between heterotrophic, mixrophic, and autotrophic organism found at any ven moment. The four indicator groups chosen : A--Ciliate indicating polysaprobity, B--glenophyta indicating alpha-mesosaprobity, C--lorococcales plus Diatomeae indicating betasosaprobity, and D--Peridineae plus rysophyceae plus Conjugatae indicating gosaprobity. Ciliata species must be counted imdiately in unfixed samples. The others are clasied into groups and counted on fixed material der microscopes. A formula is devised to give saprobic quotient. This method does not quire accurate species determinations. Saprobic otients are compared with the degree of pollun and saprobic phases. This method cannot be ed when there is an abundance of a single spes which eliminates other species. (Buchanan-vidson--Wisconsin)
6-13115

ALITATIVE AND QUANTITATIVE SALONELLA INVESTIGATIONS AND THEIR HYENIC VALUATION IN CONNECTION WITH COLI TITRE, DEMONSTRATED WITH EXIPLES FROM THE COASTAL WATERS OF EL BIGHT (WESTERN BALTIC SEA), (IN RMAN),
l Univ. (West Germany). Hygiene Institut.
Gaertner, G. Havemeister, B. Waldvogel, and H. Wuthe.
Zentralbl Bakteriol Parasitenkd Infektionskr Hyg Erste Abt Orig Reihe B Hyg Praev Med. 160(3), p 246-267, 1975.

Descriptors: *E. coli, Bacteria, Coliforms, Microorganisms, *Oceans, *Salmonella, Water pollution sources, Coasts, Testing, Sampling, *Water analysis, Human diseases, Diseases, Enteric bacteria, Sewage, Wastes.
Identifiers: *Baltic Sea, Escherichia-Coli, *Kiel Bight.

Qualitative salmonella investigations and E. coli titer determinations were carried out in about 4000 water samples from the coastal region of Kiel Bight in 1972 and 1973 and evaluated in connection with epidemiological data. About 100 samples were determined quantitatively by the MPN (most probable number) method and set in relation to the E. coli titer. The significance of positive salmonella findings in relation to the assessment of infection risk and as impurity indicators was investigated. With increasing E. coli contamination the proportion of positive salmonella findings increased (parabolic curve). Salmonella frequencies and the frequency with which the limiting values of the E. coli titer is exceeded run approximately parallel; the frequency of exceeding a limiting value of E. coli titer of 1.0 and the frequency of salmonella (determination in 100 ml) in sewage laden areas largely coincide. The quantitative salmonella investigations (MPN method) showed that up to an E. coli titer of 1.0, extremely low salmonella counts only are found (average 2/100 ml). With an E. coli titer of 0.1 a marked increase is seen. A limiting value of 1.0 is proposed for the E. coli titer in coastal waters. Epidemiological data show that an increased risk of (human) infection cannot be deduced from positive salmonella findings. The value of the information obtained from salmonella findings is small compared with the E. coli titer. Tests for salmonella should be dispensed with in routine water analysis.--Copyright 1976, Biological Abstracts, Inc.
W76-13140

METHOD AND DEVICE FOR ASCERTAINING SMALL AMOUNTS OF OIL IN WATER,
Salen and Wicander A.B., Sundbyberg (Sweden). (Assignee).
B. H. Stenstrom.
U. S. Patent No. 3,964,295, 4 p, 8 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 947, No 4, p 1495, June 22, 1976.

Descriptors: *Patents, *Oil pollution, *Oily water, Water pollution sources, *Monitoring, Oil wastes, Pollution abatement, Separation techniques, Equipment, *Pollutant identification.

A method and a device determines the oil content of small amounts of oil in water. The invention is intended to be utilized on board ships, in industries, etc., where large amounts of water are pumped out and where surveillance of the possible presence of oil is necessary and frequently regulated by legislation. A defined amount of water is removed so as to concentrate or enrich the oil and then the oil content is measured. The oil is concentrated by making a predetermined amount of oily water per unit of time pass a determined area of a filter material which absorbs or separates oil. The oil content can be measured photo-electrically by determination of the color change of the oil-absorbing filter material. (Sinha-OEIS)
W76-13156

PRESENCE OF INSECTICIDES IN SURFACE WATERS AFTER CONDITIONING TREATMENT, (IN ITALIAN),
Camerino Univ. (Italy). Istituto di Igiene.
For primary bibliographic entry see Field 5F.
W76-13160

DETERMINATION OF SODIUM FORM WATER SOFTENER BREAKTHROUGH,
Beckman Instruments, Inc., Fullerton, Calif. (Assignee).
For primary bibliographic entry see Field 5F.
W76-13161

OPTIMAL ESTIMATION OF DO, BOD, AND STREAM PARAMETERS USING A DYNAMIC DISCRETE TIME MODEL,
Purdue Univ., Lafayette, Ind. School of Electrical Engineering.
A. J. Koivo, and G. Philips.
Water Resources Research, Vol. 12, No. 4, p 705-711, August 1976. 9 fig, 10 ref.

Descriptors: *Water quality control, *Dissolved oxygen, *Biochemical oxygen demand, *Optimization, *Estimating, *Simulaion analysis, *Equations, Computers, Water pollution, Streams, Measurement, Filters, Mathematical models, Systems analysis, *Pollutant identification.
Identifiers: *Streeter-Phelps equation.

A modified Streeter-Phelps equation is used as the starting equation to obtain a discrete time mathematical representation for the biological oxygen demand and the dissolved oxygen concentration at discrete spatial locations in polluted stream. It represents an accurate discretization of the original model. The unknown parameters to be estimated are treated as state variables in order to compute their numerical values from noise-corrupted measurements. An optimal estimator is constructed for the estimation of the unknown parameters. Such a model is well-suited to computer applications, such as optimal estimation and control of pollution variables. By using the resulting discrete model, an optimal estimator is constructed to determine DO, BOD, maximum rate of photosynthetic production, and other pollution variables. These optimal estimates minimize the expected value of the sum of the squared estimation errors, given the past and the current measurements. They can be computed by constructing a Kalman filter for the process. A numerical example is presented to illustrate the applicability of the method. (Bell-Cornell)
W76-13167

SPECTRAL REFLECTANCE AND RADIANCE CHARACTERISTICS OF WATER POLLUTANTS,
Environmental Research Inst., of Michigan, Ann Arbor. Infrared and Optics Div.
C. T. Wezernak, R. E. Turner, and D. R. Lyzenga.
Report No. NASA CR-2665, April 1976. 230 p, 25 fig, 160 tab, 58 ref. NASA NAS1-13589.

Descriptors: *Remote sensing, *Water pollution, *Reflectance, Optical properties, Physical properties, Pollutants, Turbidity, Suspended solids, Oil spills, Effluents, Sewage effluents, Industrial wastes, Limnology, Oceanography, Publications, *Pollutant identification.
Identifiers: *Radiance, Visibility.

Spectral reflectance characteristics of water pollutants and water bodies were compiled using the existing literature. Radiance calculations were performed at satellite altitude for selected illumination angles and atmospheric conditions. The work described in this report was limited to the reflective portion of the spectrum between 0.40 micrometer to 1.0 micrometer. Information was included for the following general categories: (1) water bodies, (2) phytoplankton-chlorophyll, (3) suspended solids, (4) oil, (5) municipal effluent, and (6) industrial effluents. The amount of suitable material in the professional literature was found to be very limited. (Sims-ISWS)
W76-13176

BROADBAND SPECTRAL PHOTOGRAPHY OF THE JAMES RIVER,
National Aeronautics and Space Administration, Langley Station, Va. Langley Research Center.
W. E. Bressette.
Available from the National Technical Information Service, Springfield, VA 22161 as N75-24068, $3.50 in paper copy, $3.00 in microfiche. Report No. NASA TM X-72689, April 1975. 21 p, 3 fig, 2 tab, 11 ref.

Descriptors: *Remote sensing, *Aerial photography, *Rivers, *Virginia, Pollutants, Chlorophyll, Phytoplankton, Photography, Filters, Surveys, Aircraft, *Pollutant identification.
Identifiers: *James River(Va), Sunglint, Broadband spectral photography.

On May 28, 1974, a photographic mission from 5.3 km altitude was flown over the James River from Norfolk to Hopewell. During the mission, 252 photographs were exposed over the river. The photographs were divided into four simultaneously exposed groups with each group exposed through a different broadband optical filter. The four filters isolated blue-green, green, yellow, and near-infrared radiation from the water body. The report summarized the mission photography in relation to flight altitude, sunglint, and photographic exposure. It was conc James River from Norfolk to Hopewell, can be considered successful from the mission preplanniluded that in general, the May 28, 1974, photographic mission from 5.3 km altitude, over the ng standpoint, although final analysis of the radiance in the photographs versus the ground truth data is yet to be accomplished. (Sims-ISWS)
W76-13180

THE FEASIBILITY OF OIL-POLLUTION DETECTION AND MONITORING FROM SPACE: EXAMPLES USING ERTS-1 AND SKYLAB DATA,
Environmental Research Inst., of Michigan, Ann Arbor. Infrared and Optics Div.
G. C. Goldman, and R. Horvath.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A017098, $4.50 in paper copy, $3.00 in microfiche. Report No. CG-D-117-75, August 1975. 59 p, 13 fig, 8 tab, 14 ref, 1 append. DOT-CG-24, 063-A.

Descriptors: *Remote sensing, *Oil spills, *Oil pollution, Satellites(Artificial), Oceans, Estuaries, Water pollution, Radiation, Monitoring, Pollutants, Data processing, Analytical techniques, *Pollutant identification.
Identifiers: *ERTS, *Skylab.

The purpose of this study was to demonstrate the feasibility of using satellite data as a means of monitoring and detecting oil spills on oceanic and estuarian waters. Four spills, or suspected spills were investigated using photointerpretation and digital-computer techniques on ERTS-1 and SKYLAB data. The results of these investigations indicated that any of these methods might be usable if the spill is large enough to be seen by satellite, if the spill occurs more than a few kilometers off shore, and if the sky and water are relatively clear. In a case in the Atlantic Ocean, the spill was easily seen, but identification of the material was not possible. In the other three cases, the presence of the spills could not be verified at all by computer techniques. ERTS-1 and SKYLAB were not considered operationally appropriate for this type of work because of the former's 18-day overpass frequency, few spectral channels, extended bandwidths, and long information-retrieval time. The latter was considered inappropriate due to its poor data quality, long information-retrieval time, lack of data for all channels, and failure to recover the same area. Monitoring and detecting oil spills could, however, involrected. (Sims-ISWS)
W76-13181

STATISTICAL PROBABILITY CHARACTERISTICS OF THE ACCUMULATION OF RADIONUCLIDES IN FRESHWATER PLANTS, (IN RUSSIAN),
Ural Science Center, Sverdlovsk (USSR). Inst. of Plant and Animal Ecology.
L. I. Piskunov, and B. V. Popov.
Ekologiya. 5(3), p 90-93, 1974.

Descriptors: Statistical methods, *Probability, *Radioisotopes, Radioactivity, *Bioindicators, Absorption, Radioecology, Monitoring, *Pollutant identification.
Identifiers: Accumulation, Atomic, Fresh, Indicators, Nuclides, Plant, Plants, Pollution, Power, Probability, Radio, Radioactive, Statistical, Water.

The use of hydrobionts as bioindicators of radioactive pollution of water bodies is one of the prospective tasks of applied radioecology. The statistical characteristics of the distribution of the accumulation coefficients of P32, S35, Ca45, Fe59, Co60, Zn65, Rb86, Sr90, Y91, Zr95, Nb95, Ru106, Cs137, Ce144, Ra226 and U233 in some freshwater plants are presented. The data can be used for perfecting radioecological methods in dosimetric monitoring of surface waters, particularly near atomic power plants.--Copyright 1975, Biological Abstracts, Inc.
W76-13189

CONCENTRATIONS OF MERCURY, CADMIUM, LEAD AND COPPER IN THE SURROUNDING SEAWATER AND IN SEAWEEDS, UNDARIA PINNATIFIDA AND SARGASSUM FULVELLUM, FROM SUYEONG BAY IN PUSAN, (IN KOREAN),
Pusan Fisheries Coll. (Republic of Korea).
C. Y. Kim, and J. H. Won.
Bull Korean Fish Soc. 7(3), p 169-178, 1974.

Descriptors: *Mercury, *Cadmium, *Copper, *Lead, Bays, *Sea water, Asia, Heavy metals, Pollutant identification, Water pollution sources.
Identifiers: Sargassum-fulvellum, *Seaweeds, Undaria-pinnatifida, *Suyeong Bay(So Korea).

Concentrations of Hg, Cd, Pb and Cu were determined in seawater and seaweeds (U. pinnatifida and S. fulvellum) from Suyeong Bay in Pusan, South Korea, during the spring and neap tides from Jan.-April 1974. The range and mean, respectively, of the heavy metal concentrations in the seawater were: Hg, 0.00-0.39 ppb and 0.16 ppb; Cd, 0.00-0.46 ppb and 0.18 ppb; Pb, 0.00-0.94 ppb and 0.26 ppb; Cu, 0.00-0.86 ppb and 0.25 ppb. The concentrations varied slightly according to the tide. The concentration of Hg, Cd and Pb in U. pinnatifida was almost twice as much as that in S. fulvellum; the concentration of Cu in the former was slightly less than that in the latter.--Copyright 1975, Biological Abstracts, Inc.
W76-13190

CONTENT OF SOME TRACE ELEMENTS IN MACROPHYTES OF THE VOLGA DELTA, (IN RUSSIAN),
Kaspiiskii Nauchno-Issledovatelskii Institut Rybnogo Khozyaistva, Astrakhan (USSR).
V. I. Vorob'ev, and E. I. Afanas'eva.
Gidrobiol Zh. 9(6), p 75-77, 1973.

Descriptors: *Trace elements, Deltas, Copper, Iron, Aluminum, Maganese, Aquatic plants, Pollutant identification, *Absorption.
Identifiers: Limnanthemum-Nymphoides, *Macrophytes, Phragmites-Communis, Potamogeton-Perfoliatus, Salvinia-Natans, Sparganium-Romosum, *Volga delta(USSR), *Reeds.

An investigation of the quantitative content of Cu, Fe, Mn and Al in common reed (Phragmites communis), branched bur-reed (Sparganium ramosum), fringed water-lily (Limnanthemum nymphoides), perfoliate pondweed (Potamogeton perfoliatus) and floating salvinia (Salvinia natans growing in the Volga delta (USSR) showed that th ability of aquatic plants to concentrate trace ele ments is determined by the species, age and en vironmental conditions.--Copyright 1975, Biologi cal Abstracts, Inc.
W76-13194

5B. Sources Of Pollution

THERMAL RESPONSE OF HEATE STREAMS, SOLUTION BY THE IMPLICT METHOD,
Iowa Univ., Iowa City. Inst. of Hydrauli Research.
P. P. Paily, and E. O. Macagno.
Available from the National Technical Informa tion Service, Springfield, VA 22161 as PB-247 38 $5.00 in paper copy, $3.00 in microfiche. IIHR Re port No. 165, May 1974, 71 p, 10 fig, 23 ref, 2 ap pend.

Descriptors: *Model studies, Mathematic models, *Thermal pollution, Water pollution e fects, Heated water, Discharge(Water *Diffusion, Convection, *Path of pollutants.

A numerical solution is presented of the unstead convection diffusion equation which can be use for predicting the thermal response of heate rivers during all seasons. The solution which us a predictor-corrector scheme can predict th transient period as well as the steady state tem perature distributions in thermally loaded strean under changing thermal input rates an meteorological conditions. (Chilton-ORNL)
W76-12685

HTPGB1: A COMPUTER PROGRAM FOR CA CULATING FROM EXPERIMENTAL DAT THE VARIATION IN HEAT TRANSFER COE FICIENT ROUND A CYLINDRICAL SURFACE
United Kingdom Atomic Energy Authority, Risl (England). Reactor Group.
For primary bibliographic entry see Field 7C.
W76-12687

A SURVEY OF NEW YORK SURFACE WATE TEMPERATURES. AERIAL INFRARED SU VEYS OF THERMAL DISCHARGES FRO ELECTRIC GENERATING STATIONS IN NEW YORK STATE WATERS.
New York State Atomic and Space Developme Authority, New York.
Available from the National Technical Inform tion Service, Springfield, VA 22161 as PB-244 95 $4.50 in paper copy, $3.00 in microfiche. Se tember 1974. 59 p, 15 fig, 1 tab, 30 ref, 3 append.

Descriptors: Water quality, *Environmental fects, *Thermal pollution, *Remote sensin Monitoring, *Infrared radiation, *Hudson Rive *New York, *Water temperature, *Path of pol tants, Surveys.

Thermal discharge plumes were measured by ae al infrared sensing techniques at four power s tions on the Hudson River: Albany, Danskamm Point, Indian Point and Lovett. Infrared imag and related temperature contour maps are cluded in the report which indicate that the effe observed include tidal currents, local counter-c rents, recirculation of discharged water, therm striation, and mixing. The capability of the frared method to fill the current need for quanti tive data with broad synoptic coverage is ill trated. (Chilton-ORNL)
W76-12698

PRELIMINARY EVALUATION OF TH RADIOLOGICAL QUALITY OF THE WAT ON BIKINI AND ENEU ISLANDS,
California Univ., Livermore. Lawrence Liv more Lab.

or primary bibliographic entry see Field 5C.
76-12701

TUDIES OF COLUMBIA RIVER WATER UALITY DEVELOPMENT OF MATHEMATI-AL MODELS FOR SEDIMENT AND ADIONUCLIDE TRANSPORT ANALYSIS,
ttelle Pacific Northwest Labs., Richland, Wash.
Onishi, P. A. Johanson, R. G. Baca, and E. L.
lty.
vailable from the National Technical Informa-n Service, Springfield, VA 22161 as BNWL-B-2, $4.00 in paper copy, $3.00 in microfiche. Re-rt BNWL-B-452, January 1976, 53 p, 7 fig, 35 . E(45-1)-1830.

escriptors: *Model studies, *Mathematical odels, Water temperature, *Sediment transport, dioisotopes, Radioactive wastes, *Path of pol-ants, *Columbia River.
entifiers: Radionuclide transport.

a Sediment and Radionuclide Transport Pro-m, quasi-two-dimensional mathematical simu-ion models for determining radionuclide inven-ies, their variations with time, and movements sediments and individual radionuclides in the shwater region of the Columbia River below est Rapids Dam are being applied to the river ch between Priest Rapids and McNary Dams in initial sensitivity analysis. True two-dimen-nal finite element models are also being pro-mmed to provide detailed information on sedi-nt and radionuclide behavior in the river. Accu-y and convergence of these numerical codes re tested for one-dimensional steady and un-ady diffusion equations with results indicating h accuracy and good convergence of the dels. In a Temperature Analysis Program, river ter temperature data for six recording stations s analyzed and catalogued on storage devices. an accuracy test, the COLHEAT code was ap-d to the river reach between Grand Coulee and est Rapids Dam. The river water temperature dicted by the COLHEAT code agreed quite l with actual field data collected during the ne period. (Chilton-ORNL)
6-12702

VANNAH RIVER LABORATORY ENVIRON-NTAL TRANSPORT AND EFFECTS SEARCH, ANNUAL REPORT - FY 1975,
Pont de Nemours (E.I.) and Co., Aiken, S. C.
annah River Lab.
ilable from the National Technical Informa-Service, Springfield, VA 22161 as DP-1412, 5 in paper copy, $3.00 in microfiche. Report 1412, January 1976, 68 p, 26 tab, 52 fig, 100 ref.
wford, T. V., Compiler. AT(07-2)-1.

criptors: *Environmental effects, *Path of pol-nts, Ecosystems, Model studies, On-site in-igations, Biology, South Carolina, Water pol-on effects.

earch designed to develop, test, modify, and y models for calculating transport, dispersion, effects of various materials moving through ronmental systems is presented. The report in-es a number of short articles in the areas of at-pheric transport studies, soil and terrestrial gy studies, geologic studies, aquatic transport ies, aquatic biology studies, and dose-to-man ies. The focus of the various studies is on both puter modeling and field experiments. lton-ORNL)
-12714

RMAL EFFECTS, (LITERATURE IEW),
Ridge National Lab., Tenn.
primary bibliographic entry see Field 5C.
-12736

FACTORS CONTROLLING RATES OF METHANE OXIDATION AND THE DISTRIBUTION OF THE METHANE OXIDIZERS IN A SMALL STRATIFIED LAKE,
Fisheries and Marine Service, Winnipeg (Manitoba). Freshwater Inst.
J. W. M. Rudd, and R. D. Hamilton.
Archives of Hydrobiology, Vol. 75, No. 4, July 1975, p 522-538, 10 fig, 18 ref.

Descriptors: *Water pollution sources, *Methane bacteria, Methane, Oxidation, Bacteria, Thermal stratification, Epilimnion, Hypolimnion, Lakes.

Several factors influenced whole lake rates of methane oxidation. Thermal stratification controlled mixing of waters containing methane and oxygen. 95% of the methane oxidation occurred during spring and fall turnover. High oxygen concentrations reduced oxidation rates in the upper part of the water column while rapid rates occurred at oxygen concentrations of less than 1.0 mg/1. During summer stratification high oxygen concentration prevented epilimnetic methane oxidation while anoxia prevented hypolimnetic oxidation. Methane concentration was a control factor only at oxygen concentrations of less than 1.0 mg/1 in a narrow lens of activity which occurred in the metalimnion during summer stratification. The bacteria responsible for methane oxidation in this lake appear to be a new strain characterized as being psychrophilic microaerophiles. (Chilton-ORNL)
W76-12750

MEASUREMENTS OF PHYSICAL PHENOMENA RELATED TO POWER PLANT WASTE HEAT DISCHARGES: LAKE MICHIGAN, 1973 AND 1974,
Argonne National Lab., Ill.
J. V. Tokar, S. M. Zivi, A. A. Frigo, L. S. Van Loon, and D. E. Frye.
Available from the National Technical Information Service, Springfield, VA 22161, as ANL/WR-75-1. $10.50 in paper copy, $3.00 in microfiche. Report ANL/WR-75-1, 352 p, 205 fig 27 ref, append.

Descriptors: *Water pollution sources, *Thermal pollution, Nuclear powerplants, *Lake Michigan, Great Lakes, Limnology, Physical properties, On-site investigations, Discharge(Water), *Measurement, *Path of pollutants, *Pollutant identification.

The report summarizes primary field activities of the Energy and Environmental Systems Division during 1973 and 1974 on Lake Michigan. Overall objectives of the program were to work toward a better understanding and predictive capability of the physical impacts of discharging power-plant waste heat to large temperate lakes. Field site descriptions of Point Beach Nuclear Power Plant, Zion Nuclear Power Station and Donald C. Cook Nuclear Power Plant are given. Maps are presented of areas of surface thermal plumes from single or dual discharges showing that the dual discharge situation produces far field plume areas more than double those of the single discharge situation. Measurements of vertical and horizontal eddy diffusivities and of current velocities at nearshore areas were made. Aerial infrared and boat oriented thermal plume measurement techniques were compared. (See W76-12771 thru W76-12775) (Chilton-ORNL)
W76-12770

THERMAL PLUME MAPPING,
Argonne National Lab., Ill.
A. A. Frigo, L. S. Van Loon, and C. Tome.
In: Measurements of Physical Phenomena Related to Power Plant Waste Heat Discharges: Lake Michigan, 1973 and 1974. p 18-163, 119 fig, 5 tab, 2 ref. W-31-109-Eng-38.

Descriptors: *Water pollution sources, *Thermal pollution, *Mapping, Isotherms, On-site investigations, Instrumentation, Nuclear powerplants, *Lake Michigan, Great Lakes, Discharge(Water). Identifiers: *Thermal plume mapping.

The plume measurement system employed submerged temperature-sensing thermistors, digitizing and recording electronics, and positioning and depth-sounding instrumentation. Comparisons were made between a limited number of dual and single plumes where salient ambient conditions were matched approximately. Dual plumes had isotherm areas about double those of single plumes where the two jets of the dual discharge had not interacted and behaved as isolated jets. The plume behavior in this regime was weakly dependent on ambient conditions. In some comparisons, farfield isotherm areas were more than double for dual discharge plumes. In all cases, areas of intermediate field isotherms were about the same for dual and single discharges. (See also W76-12770) (Chilton-ORNL)
W76-12771

MEASUREMENTS OF EDDY DIFFUSIVITIES IN NEARSHORE REGIONS OF LAKE MICHIGAN,
Argonne National Lab., Ill.
S. M. Zivi, D. E. Frye, R. E. Buell, and L. S. Van Loon.
In: Measurements of Physical Phenomena Related to Power Plant Waste Heat Discharges: Lake Michigan, 1973 and 1974. p 164-210, 21 fig, 4 tab, 15 ref. W-31-109-Eng-38.

Descriptors: *Thermal pollution, *Diffusivity, *Eddies, Discharge(Water), *Measurement, *Lake Michigan, Instrumentation, *Path of pollutants, *Diffusion.

Measurements of vertical and horizontal eddy diffusivities produced values consistent with open lake values reported in the literature when correlated as a function of a characteristic length scale. Horizontal diffusivities were found to be unperturbed by plume stratification and interfaces within the far field. Vertical diffusivities within the plumes and in the far field were several orders of magnitude smaller than the horizontal values. The measurements provide a range of values for use in theoretical models of thermal plume dispersal where eddy diffusivity is a required input parameter. Refinement of photodensimetric methods and bottle sampling techniques were important steps in developing a field technique and methodology for more rapidly measuring eddy diffusivities. (See also W76-12770) (Chilton-ORNL)
W76-12772

A COMPARISON OF AERIAL INFRARED AND BOAT ORIENTED THERMAL PLUME MEASUREMENT TECHNIQUES,
Argonne National Lab., Ill.
R. P. Madding, G. J. Marmer, and J. V. Tokar.
In: Measurements of Physical Phenomena Related to Power Plant Waste Heat Discharges: Lake Michigan, 1973 and 1974. p 211-245, 3 tab, 18 fig, 3 ref. W-31-109-Eng-38.

Descriptors: *Thermal pollution, *Measurement, *Instrumentation, Thermometers, Remte sensing, On-site investigations, Nuclear powerplants, Discharge(Water), *Lake Michigan, Great Lakes, Infrared radiation.

Near simultaneous thermal plume mapping using the University of Wisconsin's remote aerial infrared scanning system and ANL's in situ boat measurement methods at the Point Beach Power Plant were compared on five occasions. Thermal scanning detects only surface temperatures but the data are acquired rapidly. In situ boat methods require longer times (about one hour to sufficiently define a plume) but temperatures can be measured with depth. Good agreement between the two methods was found with respect to plume features such as contour configurations, areas,

centerline temperature decays, and upwelling factors. (See also W76-12770) (Chilton-ORNL)
W76-12773

NEAR SHORE LAKE CURRENT INVESTIGATIONS,
Argonne National Lab., Ill.
D. E. Frye, L. S. Van Loon, A. A. Frigo, and S. M. Zivi.
In: Measurements of Physical Phenomena Related to Power Plant Waste Heat Discharges: Lake Michigan, 1973 and 1974. p 246-327, 28 fig, 3 tab, 4 ref. W-31-109-Eng-38.

Descriptors: *Thermal pollution, *Currents(Water), Shores, Winds, Wind velocity, Velocity, Current meters, Lakes, *Lake shores, Path of pollutants.
Identifiers: *Lake currents.

The data showed that nearshore curents to depths of three or more meters are closely correlated to the local wind field with the current speed generally being 1-3% of the wind speed. Time response of these currents was typically a few hours or less. While flow perpendicular to shore did occur and may be significant in terms of mixing a shoreline discharged effluent with offshore water, the currents in the nearshore regions were found to be predominantly in the alongshore directions. Assuming that a bidirectional current describes the nearshore regime, the direction of the flow could be predicted more than 80% of the time from the local wind direction. Bottom friction plays an important role in the inhibition of currents in the nearshore waters. (See also W76-12770) (Chilton-ORNL)
W76-12774

FIELD OBSERVATION OF THE DYNAMICS OF HEATED DISCHARGE JETS,
Argonne National Lab., Ill.
A. A. Frigo, S. M. Zivi, R. F. King, and E. D. Levinson.
In: Measurements of Physical Phenomena Related to Power Plant Waste Heat Discharges: Lake Michigan, 1973 and 1974. p 328-348, 11 fig, 1 tab, 3 ref. W-31-109-Eng-38.

Descriptors: *Thermal pollution, *Heated water, *Discharge(Water), Hydrodynamics, On-site investigations, Model studies, *Lake Michigan, Great Lakes, *Jets, Path of pollutants.

The results of an initial effort to examine the possible dynamical character of heated discharges is discussed. Hydrodynamic and thermal oscillations of measurable amplitude within thermal plumes were noted. Higher frequency oscillations for the Point Beach plant are postulated to be a manifestation of the eddy phenomenon that is active initiating the lateral dispersal of the plume. Such oscillations could cause ramifications in presently used boat techniques for measuring thermal plumes and in regulatory criteria governing heated discharges. (See also W76-12770) (Chilton-ORNL)
W76-12775

AN ANALYTICAL METHOD FOR DETERMINING HEAT TRANSFER FROM POWER PLANT COOLANT IN THE FLORIDA BOULDER ZONE,
Army Facilities Engineering Support Agency, Fort Belvoir, Va. Research and Technology Div.
M. Greenberg, and A. J. Van den Berg.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A010 432, $4.00 in paper copy, $3.00 in microfiche. Report RT-2000, July 1974, 35 p, 9 fig, 3 tab, 5 ref, 3 append.

Descriptors: *Heat transfer, *Cooling water, Heated water, Thermodynamics, Powerplants, *Florida, Geologic formations, Stratigraphy, *Path of pollutants.

The proposal suggests that a desk study and a field demonstration be conducted to investigate the receptivity and transmissivity of the geological strata underlying south Florida as a means of dissipating heat from power plant coolant at 83 degrees F. The concept of injecting the coolant into this strata, allowing a fresh water bubble to displace sea water and to form and cool for 30 days before being recirculated back to the plant is considered. It was concluded that the average temperature of the bubble would be 68.3 F with approximately 37% of the total water discharged at 61 F and 17% at 83 F. The remaining water would be a mixture at about 73.5 F. (Chilton-ORNL)
W76-12777

GEOCHEMICAL CONTROLS ON LEAD CONCENTRATIONS IN STREAM WATER AND SEDIMENTS,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 5A.
W76-12800

REMOTE SENSING STUDY OF MAUMEE RIVER EFFECTS ON LAKE ERIE,
National Aeronautics and Space Administration, Cleveland, Ohio. Lewis Research Center.
For primary bibliographic entry see Field 5A.
W76-12819

CHEMICAL DYNAMICS OF A POLLUTED WATERSHED, THE MERRIMACK RIVER IN NORTHERN NEW ENGLAND,
Massachusetts Inst. of Tech., Cambridge. Dept. of Earth and Planetary Sciences.
J. Ceasar, R. Collier, J. Edmond, F. Frey, and G. Matisoff.
Environmental Science and Technology, Vol. 10, No. 7, p 697-704, July 1976. 4 fig, 10 tab, 21 ref.

Descriptors: *Model studies, *Water chemistry, Chemical properties, *Watersheds(Basins), *Water quality, *Massachusetts, *New England, Analytical techniques, Calcium, Magnesium, Mathematics, Geochemistry, Chemical analysis, Chemistry of precipitation, Runoff, Nutrients, Phosphates, Ions, Seasonal, Suburban areas, Municipal wastes, Agricultural runoff, Dissolved solids.
Identifiers: Chemical dynamics, Polluted watersheds, *Merrimack River, Northern New England, Flux models, Flow models.

A time series of the major-ion and nutrient composition of the Merrimack River was obtained at several locations on the main channel over a one-year period. Combination of the chemical data with the flow allowed chemical mass fluxes to be calculated and the major chemical inputs modeled. Sodium, calcium, magnesium, and potassium showed significant anthropogenic input (greater than 50%) as well as natural input; phosphate was predominantly anthropogenic while silicate was predominantly natural. It was found that the dependence of concentration on flow can be modeled for some constituents using two input components. The first component had a constant mean composition and steady flux and was identified as groundwater and sewage. The other components had a mean composition which was flow dependent and was identified with runoff events. (Henley-ISWS)
W76-12833

EXPERIMENTAL STUDY OF TURBULENT STRATIFIED SHEARING FLOW,
McGill Univ., Montreal (Quebec). Dept. of Civil Engineering and Applied Mechanics.
For primary bibliographic entry see Field 2L.
W76-12841

TRANSIENT DISPERSION IN UNIFORM POROUS MEDIA FLOW,
Sargent and Lundy, Chicago, Ill.
H. T. Shen.
Journal of the Hydraulics Division, Americ Society of Civil Engineers, Vol 102 No HY Proceedings Paper 12202, p 707-716, June 1976 fig, 12 ref, 3 append.

Descriptors: *Dispersion, *Unsteady flo *Hydraulics, *Water pollution sources, *Por media, Adsorption, Fourier analysis, Aquife Groundwater, Analytical techniques, Mat matics, Seepage, Equations, Mathematical dies, *Path of pollutants.
Identifiers: *Radioactive decay, *Transi dispersion, Nonconservative substances, Lin adsorption.

Generalized analytical solutions were derived transient multidimensional dispersion of nonc servative substances in steady uniform seepa The finite line or plane boundary source oriented normal to the flow with time-depend concentration. Dispersion in longitudinal, late and transverse directions, radioactive decay, linear adsorption were considered. The soluti derived were valid for convective-dispersion semi-infinite homogeneous isotropic satura porous medium. Method of images or Fourier ries technique can be used to include the effec nonflux boundary conditions, when a confi aquifer is to be studied. A two-dimensional ex ple was given for the case when the concentra of the line source varies exponentially with ti The solutions given in this study can be use study the contamination of groundwater resul from pollutant sources. (Singh-ISWS)
W76-12842

COASTAL DISPERSION OF POLLUTANTS,
Polish Academy of Sciences, Gdansk. Inst Hydraulic Research.
R. B. Zeidler.
Journal of the Waterways, Harbors and Coa Engineering Division, American Society of C Engineers, Vol. 102, No. WW2, Proceedings Pa 12121, p 235-254, May 1976. 13 fig, 16 ref, 2 pend.

Descriptors: *Thermal pollution, *Coastal gineering, *Dispersion, *Diffusivity, *Edd Waste water disposal, Heated water, Ocea Waves(Water), Currents(Water), Analysis, E tions, Turbulence, Mathematical models, Mixi
Identifiers: *Eddy diffusivity.

The turbulent eddies of different sites which de mine the far field dispersion of pollutants in marine environment were investigated ana cally. For fine turbulence and regular advect the vaiidity of the local isotropy law was sidered and the ways the shore, circulation c multiple energy inputs, velocity gradients, wa and other factors modify this law in the coa zone were shown. A model of the dispersive fects due to wave-current interactions proposed, and a formula was given for the spe eddy diffusivity due to waves and currents. steady-state diffusion equation was solved f fairly general case with exponential velocities eddy diffusivities. By the Fourier transform, solution was used to include the effect mesoscale eddies which destroy the reg spreading patterns. A step-by-step procedure proposed which combined fine turbulence mesoscale effects. (Adams-ISWS)
W76-12843

THE EVAPORATION AND DEGRADATION N-NITROSO DIMETHYL AMINE IN AQUE SOLUTIONS,
Air Force Civil Engineering Center, Kirt AFB, N. Mex.
M. G. MacNaughton, and T. B. Stauffer.
Available from the National Technical Infor tion Service, Springfield, VA 22161 as ADA 922, $3.50 in paper copy, $3.00 microfiche. Re AFCEC-TR-75-9, March, 1975. 16 p, 6 fig, 8 re

LIBRARY OF THE UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN

scriptors: *Waste water treatment, Geochemis-, Environmental engineering, *Evaporation, egradation(Decomposition), *Aqueous solu-ns, Lagoons, Effluent streams, Public health, vironmental effects, Organic compounds, aste assimilative capacity.
ntifiers: *N-nitroso dimethyl amine, ydrazine compounds.

e fate of N-nitroso dimethyl amine (NDMA) in eous solutions and in a 25% caustic waste eam, which is produced in the manufacture of ymmetrical dimethyl hydrazine (UDMH) was died. The conditions were intended to approxi-e those which would effect evaporation, radation, or both of NDMA in an open lagoon. MA in aqueous solutions is easily evaporated photolyzed. Evaporation accounted for most he removal in basic solutions, was low for acid tions, and accounted for half the removal in tral solutions. The rate of photolysis is higher cid solutions. In acid and neutral pHs, nitrite erely inhibited the photolysis of NDMA. The poration rate was slightly increased by an in-se in ionic strength. These results imply that majority of the NDMA will volatilize from the tions very rapidly unless the waste is neutral-l. If the waste is neutralized and the heat of tralization does not distill off the NDMA, tolysis will predominate unless nitrite is ent. If nitrite were present in this situation, lit-f the NDMA would leave the lagoon eiher by tilization or photolysis. (Snyder-FIRL)
5-12852

BAN STORMWATER RUNOFF: DETER-IATION OF VOLUMES AND FLOWRATES,
ois Univ. at Urbana-Champaign. Dept. of Civil ineering.
. Chow, and B. C. Yen.
ort EPA-600/2-76-116, May, 1976. 252 p, 69 13 tab, 66 ref, 4 append.

criptors: *Analytical techniques, *Drainage, nfall, *Runoff, *Storm drains, Surface nage, Computer programs, Environmental en-ering, Hydraulics, Hydrology, Mathematical els, Sewers, Urbanization, Water pollution, er quality.

epth-duration-frequency analysis method was loped for rainstorms with short return period frequency) for urban storm water runoff agement and control purposes. The Illinois n Storm Runoff method is described, includ-he development of the model to couple with llinois Storm Sewer System Simulation Model he formulation of a non-reactive water quali-odel to compute the pollutant concentrations rban runoff. Selected runoff prediction ods, the rational method, unit hydrograph od, Chicago hydrograph method, British sport and Road Research Laboratory method, ronmental Protection Agency (EPA) Storm r Management Model, and the Illinois Urban n Runoff method, are evaluated using the ded hydrographs of four rainstorms in the ale Avenue Drainage Basin in Chicago. The ods are applied to compute the predicted ru-hydrographs, and the results compared with recorded hydrographs. The most suitable od depends on the objective and accuracy red. The rational method is often satisfactory quick, simple approximation of peak runoff for a project involving high accuracy and s of runoff distribution, the Illinois Urban n Runoff method is suitable. The EPA Storm r Management Model may be the alternative downstream backwater effects are unimpor-When the unit hydrograph for the drainage is unavailable, the Transport and Road rch Laboratory method appears preferable e Chicago and University of Cincinnati ods in most cases. (Snyder-FIRL)
12858

REVIEW AND EVALUATION OF AVAILABLE TECHNIQUES FOR DETERIMINING PERSISTENCE AND ROUTES OF DEGRADATION OF CHEMICAL SUBSTANCES IN THE ENVIROMENT,
Syracuse Univ. Research Corp., N. Y. Life Sciences Div.
For primary bibliographic entry see Field 5A.
W76-12865

EFFECT OF THE SOIL MOISTURE REGIME ON THE PASSAGE OF STRONTIUM-90, CESIUM-137 AND CERIUM-144 FROM SOIL INTO SOLUTION, (IN RUSSIAN),
Ural Science Center, Sverdlovsk (USSR). Inst. of Plant and Animal Ecology.
N. V. Kulikov, I. V. Molchanova, and E. N. Karavaeva.
Ekologiya. 4(4), p 57-62, 1973.

Descriptors: *Soil moisture, Soils, Path of pollutants, *Radioisotopes, Distribution, Water pollution sources.
Identifiers: *Cerium-144, *Cesium-137, *Strontium-90.

The distribution of 3 radionuclides (Sr90, Cs137 and Ce144), differing in physicochemical properties, in the soil-solution system was studied upon changing the relationship of the solid and liquid phases of the soil within wide limits. Experiments established that with an increase of the soil moisture content, the quantity of Cs137 and Ce144 increases markedly in an equilibrium solution, whereas the content of Sr90 changes less appreciably. Seasonal differences of soil moisture under natural conditions are probably a cause of leveling of the rate of vertical migration of these radionuclides in soil.--Copyright 1975, Biological Abstracts, Inc.
W76-12868

ENVIRONMENTAL SURVEY OF TWO INTERIM DUMPSITES--MIDDLE ATLANTIC BIGHT.
Environmental Protection Agency, Annapolis, Md. Annapolis Science Center.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-244 623, $6.75 in paper copy, $3.00 in microfiche. Report EPA-903/9-74-010a, January, 1974. 158 p, 12 fig, 40 tab, 86 ref, 3 append. Lear, D. W., Smith, S. K., and O'Malley, M. L., editors.

Descriptors: *Pollutant identification, *Analytical techniques, *Sludge disposal, *Waste dumps, *Oceans, Surveys, Continental shelf, Cruises, *Atlantic Ocean, Oceanography, Industrial wastes, Acids.
Identifiers: Ocean dumping, Oceanographic cruises, Oceanographic surveys, *Middle Atlantic Bight.

An oceanographic cruise was made in the fall of 1973 to an interim municipal sludge dumpsite and an interim industrial acid waste dumpsite which had been studied on a similar cruise the previous spring. These sites are on the continental shelf in the Middle Atlantic Bight. Hydrographic and bathymetric conditions, major circulation patterns, water quality, sediment composition, heavy metals in sediments and biota, bacteriology, phytoplankton and zooplankton communities, vertebrates, and benthic invertebrates were studied. Temperature and salinity profiles indicated the presence of a pycnocline, but differences between surface and bottom waters were relatively small. Neutral buoyance seabed drifters left by the previous cruise indicated net bottom water movement toward the west and southwest toward the Delaware, Maryland, and Virginia beaches. Nutrient concentration in waters near the bottom varied seasonally. Elevated nitrate plus nitrite concentrations occurred in bottom waters at the municipal sludge site. Phytoplankton populations were characteristic of mid-temperate coastal communities during fall and winter. Higher mercury, nickel, and manganese concentrations in zooplankton samples than from the previous cruise suggest that certain metals may accumulate in zooplankton. Geographic distribution patterns indicate deposition of heavy metals in sediments as a result of waste disposal. Iron concentrations in sand dollars were less than during the spring cruise. A mechanism is postulated in which accumulation at the pycnocline makes iron less available to the bottom community. (Snyder-FIRL)
W76-12875

HALOGENATED ORGANICS IN TAP WATER: A TOXICOLOGICAL EVALUATION,
Health Effects Research Lab. Cincinnati, Ohio.
For primary bibliographic entry see Field 5C.
W76-12885

ORIGIN, CLASSIFICATION AND DISTRIBUTION OF CHEMICALS IN DRINKING WATER WITH AN ASSESSMENT OF THEIR CARCINOGENIC POTENTIAL,
National Cacer Inst., Bethesda, Md.
For primary bibliographic entry see Field 5C.
W76-12886

MODELING RESIDUAL CHLORINE LEVELS: CLOSED CYCLE COOLING SYSTEMS,
Industrial Environmental Research Lab., Cincinnati, Ohio.
For primary bibliographic entry see Field 5C.
W76-12893

A KINETIC MODEL FOR PREDICTING THE COMPOSITION OF CHLORINATED WATER DISCHARGED FROM POWER PLANT COOLING SYSTEMS,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 5C.
W76-12894

THE CONDUCT OF CERTAIN LONG-LIVED ISOTOPES IN ROCKS IN THE CASE OF THEIR CONTAMINATION WITH NONTECHNICAL EFFLUENTS OF THE ATOMIC ELECTRIC POWER STATIONS (AES), (IN RUSSIAN),
E. I. Orlova, V. A. Smirennaya, and R. A. Chelysheva.
Gig Sanit. 38(12), p 65-68, 1973.

Descriptors: *Radioisotopes, Sorption, *Rocks, *Isotope studies, Effluents, *Cation adsorption, Strontium radioisotopes, Nuclear powerplants, Path of pollutants.
Identifiers: *Cesium-137, *Cobalt-60, *Ruthenium-106, *Strontium-90.

The sorption of isotopes by loose mountainous rocks was studied. Surface-active substances affected the migration of Ru106 and Co60, while Cs137 and Sr90 contained in nontechnical effluents were present in a cation form, which was well sorbed by rocks.--Copyright 1975, Biological Abstracts, Inc.
W76-12908

BEHAVIOR OF CESIUM-137 IN SOILS AND SOIL-PLANT SYSTEMS, (IN POLISH),
Polish Academy of Sciences, Warsaw. Agricultural Isotopes Lab.
K. Smierzchalska.
Postepy Nauk Roln. 20(1), p 89-107, 1973.

Descriptors: *Radioisotopes, Radioactivity, *Fallout, *Soil-water-plant relationships, Metabolism, Europe, Soils, *Strontium radioisotopes, Sorption.
Identifiers: *Cesium-137, *Poland.

General comments on the intake of radioactive fallout by plants are presented. Cs-137 and Sr-90 con-

stitute dangerous components of radioactive fallout. Investigations on radioactive pollution are of 2 types: control of Cs-137 and Sr-90 content in soils, waters and precipitation and behavior of various radionuclides in soil-plant-animal-man systems. The average Cs-137 content in Polish soils is given. Assimilability of Cs-137 in the soil-plant system is discussed, including sorption and desorption of Cs-137 in soils. The presence of certain ions and their concentration in the solution-sorption system can modify the reaction of Cs-137 sorption and desorption in soils.--Copyright 1975, Biological Abstracts, Inc
W76-12909

POPULATION BALANCE USE IN DILUTE IMPURITY PROBLEMS,
Iowa State Univ., Ames. Dept. of Nuclear Engineering; and Iowa State Univ., Ames. Dept. of Chemical Engineering.
J. D. Stevens, and P. M. Schierholz.
Journal of the Environmental Engineering Division-ASCE, Vol. 102, No. EE2, p 337-346, April, 1976. 4 fig, 5 ref, 2 append.

Descriptors: *Waste water treatment, *Analytical techniques, *Chemical precipitation, *Particle size, *Nucleation, Growth rates, Flow rates, Equations, Model studies, Calcium compounds, Crystallization, *Waste dilution.
Identifiers: *Population balance.

The population balance for chemical processes and its applications are introduced. In systems in which precipitation occurs, a population balance permits the characterization of crystal size distribution (CSD) in terms of the birth rate (nucleation), the growth rate, and, if applicable, the death rate. The population balance states that the number of discrete particles must be conserved, and if birth, death, and flow rates are properly represented then all particles can be accounted for. An equation providing a functional relationship between size and population density is derived from the population balance. The technique for obtaining kinetic models for nucleation and growth rate is illustrated. Application of the techniques in a study of the precipitation of calcium carbonate when solutions of calcium sulfate and sodium carbonate are mixed in a continuous crystallizer is described. The analytical approach is useful for processes involving sludge return. The population balance analysis approach is applicable to many environmental situations in which a dilute amount of solute is removed by crystallization. The CSD can be used to derive kinetic relationships used to predict effects of operating changes on the process. (Snyder-FIRL)
W76-12914

CONTRIBUTION ON THE KNOWLEDGE OF THE ORGANIC IN THE COASTAL WATERS OF THE GDR: V. THE VARIABILITY OF THE CHEMICAL OXYGEN CONSUMPTION AT SELECTED STATIONS OF THE WATERS IN THE SHALLOW INLETS TO THE SOUTH OF THE ZINGST PENINSULA DURING THE SYNOPTIC INVESTIGATION IN 1972, (IN GERMAN),
Rostock Univ. (East Germany). Dept. of Biology.
G. Schlungbaum, F. Fischer, and S. Stolle.
Wiss Z Univ Rostock Math-Natur-Wiss Reihe 22(10), p 1095-1100, 1973.

Descriptors: *Organic matter, Coasts, Europe, Inlets, Chemical oxygen demand, *Sampling.
Identifiers: *Baltic Sea, *East Germany, Zingst Peninsula(GDR).

Samples taken 4 times daily at 4 stations in the shallow inlets to the S of the Zingst Peninsula (East Germany) were used to determine the degree of fluctuation of organic matter in the water by measuring the chemical O2 consumption. The fluctuation are primarily an expression of changes in the hydrographical situation. The greatest fluctuations are found at the station most affected by the Baltic Sea. Comparisons are made with parameters for cloudiness, yellow substances and depth of visibility.--Copyright 1976, Biological Abstracts, Inc.
W76-12916

FATE OF METALS IN WASTEWATER DISCHARGE TO OCEAN,
CDM, Inc., Pasadena, Calif.
N. K. Rohatgi, and K. Y. Chen.
Journal of the Environmental Engineering Division-ASCE, Vol. 102, No. EE3, p 675-685, June, 1976. 6 fig, 4 tab, 9 ref, append.

Descriptors: *Pollutant identification, *Waste water(Pollution), *Discharge(Water), Oceans, *Deposition(Sediments), Cadmium, Copper, Nickel, Lead, Zinc, *Path of pollutants, *California, Bays.
Identifiers: *Santa Monica Bay(Calif).

Experimental results on the settling velocity of sludge solids were used to determine the annual deposition of trace metals on the Santa Monica Bay floor. Trace metal concentrations around the outfall areas are generally lower than the corresponding metal concentrations in the waste effluent particulates. Calculations indicate that approximately 30% of the total solids discharged will be deposited in the sediment and the remainder transported at 0.1 m/sec. About 10% of the total of cadmium, copper, nickel, lead, and zinc will be deposited within 2 km of the outfall. Predictions using experimental data indicate that a significant amount of soluble trace metals will be made available to marine organisms from the discharge of waste water effluent. Their validity can be argued because of the size and complexity of the ocean system. It is certain, however, that only a small portion of trace metals from waste water suspended particulates is represented by the Santa Monica Bay sediment, the remainder being mobilized into the ocean as soluble trace metals. (Snyder-FIRL)
W76-12927

CHEMICAL AND PLANT EXTRACTABILITY OF METALS AND PLANT GROWTH ON SOILS AMENDED WITH SLUDGE,
Department of Agriculture, Ottawa (Ontario). Soil Research Inst.
J. D. Gaynor, and R. L. Halstead.
Canadian Journal of Soil Science, Vol. 56, No. 1, p 1-8, February, 1976. 3 tab, 28 ref.

Descriptors: *Pollutant identification, *Plant growth, *Loam, *Clays, *Sludge, Cadmium, Lead, Copper, Zinc, Absorption.

Sludge was mixed with three soils with widely different properties and incubated, then the mixture was seeded with lettuce and tomato. The soils used were Fox sandy loam (sl), Granby sl, and Rideau clay (c). Sludge addition increased soil pH, total carbon, sodium-bicarbonate extractable phosphorus, cation exchange capacity, and exchangeable calcium. DTPA-extractable cadmium increased 2 to 5 times, lead 2 to 3 times, copper 3 to 7 times, and zinc 7 to 31 times. Incubation for 11 months did not greatly change metal extractability in Granby and Fox sl soils, but extractable zinc, copper lead, and cadmium were reduced in the clay soil following incubation. Raising lettuce reduced the quantity of metal extracted from Fox sl soil and, to a lesser extent, from Rideau c soil, but not from Granby sl soil. Lettuce yields were significantly reduced for the first crop grown on Rideau c and Granby sl soils mixed with fertilizer and sludge compared to yields produced by these soils treated with fertilizer only. All three harvests were reduced with sludge-treated Fox sl soil. The yield reductions for the first two soils were attributed to a salt effect. Raising crops decreased the saturation extract conductivities for all sludge treated soils. Generally, zinc, copper, and lead tissue concentrations in lettuce from Fox and Gra
by sl soils were significantly increased but tot
uptake was only increased for zinc. Metal uptal
and tissue concentrations for lettuce grown
Rideau c soil treated with sludge and fertiliz
were equal to or less than in lettuce from Rideau
soil treated with fertilizer only. Similar tren
were observed to a lesser extent with tomato
(Snyder-FIRL)
W76-12929

**SOLID WASTES AND WATER QUALIT
(LITERATURE REVIEW),**
Environmental Protection Agency, Washingto
D. C. Wastewater Research Div.
For primary bibliographic entry see Field 5E.
W76-12933

**POLLUTANT AEROSOL DEPOSITION IN
SOUTHERN LAKE MICHIGAN,**
Illinois State Water Survey, Urbana. Atmosphe
Sciences Section.
D. F. Gatz.
Water, Air, and Soil Pollution, Vol. 5, No. 2,
239-251, 1975. 1 fig, 6 tab, 33 ref.

Descriptors: *Water pollution sources, *Aeros
*Lake Michigan, *Illinois, *Indiana, Fallout,
pollution effects, Iron, Lead, Titanium, Parti
size, Precipitation(Atmospheric), Estimat
equations.
Identifiers: Vanadium, Chicago(Ill).

An important environmental pathway of nutrie
and toxic materials into the Great Lakes is via
atmosphere. Estimates of pollutant aerosol in
into southern Lake Michigan were made, base
single calculated emission inventory and estima
of the fraction of emissions that enter the lake.
ternative estimates of urban elemental emissi
and their wet and dry deposition in the lake w
also made. Emissions were calculated from
served elemental concentrations in urban
Recently measured wet and dry deposit
parameters were used to calculate deposition.
results suggest that atmospheric inputs of po
tant aerosols into the lake are importa
representing sizeable fractions of total lake in
of iron, lead, titanium, and vanadium. Annual
and dry depositions are approximately eq
Between 3-15% of the elemental emissions fr
Chicago and northwest Indiana enter the lake.
fraction of emissions deposited in the lake
creases with particle size. The most toxic e
sions from increased coal burning near the
will be largely in relatively small particles, so t
deposition to the lake should be smaller than p
portional to the extra aerosol mass releas
(Buchanan-Davidson--Wisconsin)
W76-12935

LAKE GEORGE SITE SYNTHESIS, 1974-1975
Rensselaer Polytechnic Inst., Troy, N.Y. Fr
Water Inst.
For primary bibliographic entry see Field 5C.
W76-12937

**COMPARISON OF SINGLE-POINT INJ
TIONS IN PIPE FLOW,**
Middle East Technical Univ., Ankara (Turk
Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W76-12971

**SEDIMENT FLUSHING AFTER DREDGING
TIDAL BAYS,**
Royal Inst. of Tech., Stockholm (Sweden). D
of Hydraulics.
For primary bibliographic entry see Field 8C.
W76-12974

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OSSES OF NITROGEN IN SURFACE RUNOFF N THE BLACKLAND PRAIRIE OF TEXAS,
exas Agricultural Experiment Station, College tation.
or primary bibliographic entry see Field 5G.
76-12982

FFICIENCY OF NITROGEN, CARBON, AND HOSPHORUS RETENTION BY SMALL GRICULTURAL RESERVOIRS,
gricultural Research Service, Oxford, Miss. edimentation Lab.
or primary bibliographic entry see Field 4D.
76-12983

ODEL FOR PREDICTING SIMULTANEOUS OVEMENT OF NITRATE AND WATER HROUGH A LOAMY SAND,
isconsin Univ., Madison. Dept. of Soil Science.
. A. Jury, W. R. Gardner, P. G. Saffigna, and C. Tanner.
il Science, Vol. 122, No. 1, p 36-43, July 1976. 8 , 16 ref.

escriptors: *Mathematical models, *Soil water ovement, *Dispersion, *Nitrates, Absorption, nvection, Nitrification, Soil profiles, Water le, Evapotranspiration, Leachate, Drainage, simeters, Moisture content, Infiltration, Equans, Mineralogy.
entifiers: *Mineralization, *Solute transport.

simulation model describing nitrate movement ough a potato-cropped Plainfield loamy sand s described. Physical processes modeled inded dispersion, convection, plant uptake, rification, and mineralization. The soil water w regime was treated approximately by dividing soil profile into three layers between the surce and the water table and generating water flux water content profiles by solving a series of ss balance equations which include submodels evapotranspiration and internal drainage. This ormation was combined with the solute equan and was solved numerically by the finite elent method. Model predictions of nitrate movent often qualitatively agreed with field data en symmetrically comparable profiles were d. Nonuniform infiltration across the hill-fur- unit induced large local variability in solute nsport. Predicted and measured nitrate concenions in lysimeter leachates were in closer eement when the nonuniform infiltration patn was incorporated into the model. (Visocky - VS)
6-12985

LUTE DISPERSION IN SATURATED SOIL LUMNS,
nnecticut Agricultural Experiment Station, rrs. Dept. of Soil and Water.
. Starr, and J. Y. Parlange.
Science, Vol 121, No 6, p 364-372, June 1976. , 2 tab, 19 ref.

criptors: *Solutes, *Dispersion, *Saturated s, *Tracers, Flow rates, Diffusion, Laboratory s, Mathematical models, Stability, Porosity, phical analysis, Density, Viscosity, Darcys Hydraulic gradient, Velocity, Particle size, orides.
tifiers: *Chloride-36, *Soil columns, Fingermodel, Glass beads, Concentration, akthrough curves.

oride-36 traced dispersion in a saturated soil. amount of dispersion in the vertical soil mns depended upon flow rates and direction the density difference of the displacing solu- The diffusion model was adequate for the kthrough curves when molecular diffusion primarily responsible for dispersion. For the r cases, an explicit finger model was postu- , which provides physical justification for the rved diffusion coefficient for the neutrally and overstable configuration. In the unstable configuration, the finger model explained why dispersion in a soil is an order of magnitude larger than in glass beads of comparable grain size. (Visocky-ISWS)
W76-12986

EMISSION OF SULFUR FROM LAKE ONTARIO SEDIMENTS,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 2J.
W76-12987

THE OCCURRENCE OF ORGANIC MICROPOLLUTANTS IN THE RIVER RHINE AND THE RIVER MAAS IN 1974,
Netherlands Waterworks, Rijswijk. Testing and Research Inst.
For primary bibliographic entry see Field 5A.
W76-12988

GROUND-WATER QUALITY VARIATION IN PHELPS COUNTY, MISSOURI,
Forest Service (USDA), Rolla, Mo. Clark National Forest.
C. P. Tryon.
Ground Water, Vol. 14, No. 4, p 214-223, July-August 1976. 10 fig, 2 tab, 17 ref.

Descriptors: *Groundwater, *Water quality, *Nitrates, *E.coli, *Missouri, *Land use, Pastures, Farm wastes, Agriculture, Karst, Well data, Depth, Correlation analysis, Water pollution, Data collections, Rural areas, Human population.
Identifiers: *Phelps County(Mo).

The existing quality of Phelps County, Missouri groundwater in the depth zone most commonly penetrated by nonpublic wells was defined. Information from 675 water wells showed that discrete areas of differing groundwater quality can be identified and mapped. It was learned that the best quality groundwater, as judged by its low nitrate content and coliform bacteria density, is found in areas of relatively little agricultural (pasture and livestock) land use; the poorest quality is found in areas of intensely developed karst and greater agricultual land use; the adverse effect of agricultural land use on groundwater quality is more severe in the intensely developed karst than in the less intensely developed; rural population density and soil association variations have no readily discernible effects on groundwater quality; nitrate content varies seasonally and in response to rainfall, and decreases with increasing well depth; coliform bacteria density is positively correlated with nitrate content. (Visocky-ISWS)
W76-12991

NUTRIENT LOSSES IN SURFACE RUNOFF FROM WINTER SPREAD MANURE,
Wisconsin Univ., Madison, Dept. of Agricultural Engineering.
J. C. Converse, G. D. Bubenzer, and W. H. Paulson.
Transactions of the American Society of Agricultural Engineers, Vol. 19, No. 3, p 517-519, May-June 1976. 1 fig, 6 tab, 10 ref. OWRT B-076-WIS (6).

Descriptors: *Agricultural runoff, *Farm wastes, *Agricultural watersheds, *Water pollution sources, *Nutrients, *Wisconsin, Precipitation, Nitrogen, Phosphorus, Potassium, Alfalfa, Winter.
Identifiers: Ammonium.

Runoff and nutrient losses from ten alfalfa plots were monitored for a 3 year period. Each plot was 13.2 m by 3.0 m, with slopes ranging from 10 to 12%. Dairy cattle manure was applied to two plots in the fall winter, and spring at the rate of 2.25 kg/sq m (wb). The remaining four plots served as checks. Runoff was measured using tipping buckets and proportionally sampled for nutrient analysis. Annual precipitation for the 3 year period ranged from 1054 to 1088 mm, with 12% as snow. The average annual runoff from the check and the fall, winter, and spring applied manure plots was 136, 73, 104 and 106 mm, respectively. No significant differences were observed in the nutrient losses from the various treatments. Losses for the third year were greater than the previous 2 year period and were attributed to the higher percentage of total runoff that occurred as surface runoff during the 1973-74 winter months as compared to earlier years. (Lardner-ISWS)
W76-12993

VARIATION OF SUSPENDED SEDIMENT LOAD IN THE PALOUSE REGION OF THE NORTHWEST,
For primary bibliographic entry see Field 5G.
W76-13012

FACTORS INFLUENCING THE LOSS OF NITROGEN AND PHOSPHORUS FROM A TRACT OF IRRIGATED LAND,
Idaho Univ., Moscow. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5G.
W76-13014

ESTABLISHING WATER, NUTRIENT AND TOTAL SOLIDS MASS BUDGETS FOR A GRAVITY-IRRIGATED FARM,
Idaho Univ., Moscow. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 3F.
W76-13015

SUSPENDED SEDIMENT AND TURBIDITY IN IRRIGATION RETURN FLOWS - A PROTOTYPE STUDY,
Soil Conservation Service, Spokane, Wash.
S. Hobson, B. Autry, and B. McGuire.
Presented at the 1975 Winter Meeting of the American Society of Agricultural Engineers, December 15-18, 1975, Chicago, Illinois. 12 p, 2 fig. ASAE Paper 75-2547.

Descriptors: *Suspended solids, *Suspended load, Sediment discharge, *Sediment load, Sediment yield, *Turbidity, *Surface irrigation, Return flow.

Field measurements of inflow and outflows quantity and quality (suspended sediments and turbidity) were taken from five farm units. Canals, wasteways, and sediment basins were similarly measured. The results provide prototype baseline relationships of the effects of surface irrigation on these two parameters. (Skogerboe-Colorado-State).
W76-13017

DYNAMICS OF SALTS SIO2, R2O3, MNO AND WATER-SOLUBLE ORGANIC MATTER IN UNDERGROUND WATER, (IN RUSSIAN),
Akademiya Nauk SSSR, Novosibirsk. Inst. of Soil Sciences and Agrochemistry.
N. I. Bazilevich, T. N. Ryabova, and V. M. Kurachev.
Izv Sib Otd Akad Nauk SSSR Ser Biol Nauk. 2, p 14-19, 1973.

Descriptors: *Organic matter, *Groundwater, *Salts, Silica, Bicarbonates, Humus, Flocculation, Chemical properties, Manganese.
Identifiers: Sesquioxides, *Sodium bicarbonate.

The paper deals with the formation of chemical composition of underground water in the Central Baraba (Central part of the Barabinsk lowland, USSR) depending on flocculation of their water table, direction of transport and soil formation.

The accumulation of silica, sesquioxides and water-soluble humus in the waters depended on sodium bicarbonate concentration.--Copyright 1974, Biological Abstracts, Inc.
W76-13043

TWO-DIMENSIONAL WATER QUALITY MODELING AND WASTE TREATMENT OPTIMIZATION FOR WIDE, SHALLOW RIVERS,
Wisconsin Univ., Madison.
J. W. Eheart.
Ph.D. Thesis, 1975, 371 p.

Descriptors: *Waste water treatment, *Sewage treatment, *Sewerage, Analytical techniques, *Biochemical oxygen demand, Water quality standards, *Mathematical models, Waste treatment, Optimization, Rivers, Model studies, Path of pollutants, *Dissolved oxygen, Distribution.

A mathematical model was developed for two-dimensional steady-state dissolved oxygen and biochemical oxygen demand (BOD) distribution from the discharge of treated sewage into a wide, shallow river. The results produced by the model were compared with the results of simpler models in a hypothetical case. The implications of the assumptions upon which the simpler models are based are discussed. The model was tested with field data and found to be slightly more accurate than a variation of the model which assumes the channel to be prismatic, and much more accurate than a simpler model assuming a rectangular channel with plug flow. The clearlane was defined as a means to specify standards for ambient water quality. The model and linear programming were used in determining the optimal strategy for sewage treatment for a hypothetical river basin with specified clearlane standards. The dependence of the optimal strategy on the clearlane location was investigated. (Snyder-FIRL)
W76-13058

WATER QUALITY MODEL OF A SALT-WEDGE ESTUARY,
Geological Survey, Tacoma, Wash.
E. A. Prych, and W. L. Haushild.
In: Symposium on Modeling Techniques, Volume II; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 1138-1155, 1975. 8 fig, 9 ref.

Descriptors: *Model studies, Numerical analysis, Water quality, *Saline water intrusion, *Estuaries, Methodology, *Salinity, *Water temperature, *Chlorophyll, *Dissolved oxygen, Biochemical oxygen demand, Tidal effects, *Path of pollutants, *Washington.
Identifiers: *Duwamish River estuary(Wash).

A numerical model has been developed and used to calculate salinity, temperature, chlorophyll a (phytoplankton) concentration, biochemical oxygen demand, and dissolved-oxygen concetration in the Duwamish River estuary, Washington. In the model, the estuary is divided vertically into the wedge and the upper layer; the latter is divided into three sublayers. Longitudinally, the estuary is divided into about 35 segments; laterally, the estuary is assumed to be homogeneous. The wedge model is Lagrangian, and the upper-layer model is Eulerian in a coordinate system that moves with the fluid in the wedge. All velocities are computed using conservation-of-volume equations, observed data, and tide stages. The fluid-transport processes modeled are longitudinal advection and dispersion in the wedge; entrainment from the wedge to the upper layer; and longitudinal advection, vertical advection, and vertical diffusion in the upper layer. Biochemical and other physical processes that affect the constituent concentrations are also simulated. The computed concentrations agreed reasonably well with observed data. (See also W76-10415) (Woodard-USGS)
W76-13063

OCCURRENCE OF ARSENIC IN THE DRY CREEK BASIN, SONOMA COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 5A.
W76-13068

EPIFAUNA AT JACKSON POINT IN PORT VALDEZ, ALASKA, DECEMBER 1970 THROUGH SEPTEMBER 1972,
Geological Survey, Anchorage, Alaska.
For primary bibliographic entry see Field 5A.
W76-13070

SUBLACUSTRINE FAN MORPHOLOGY IN LAKE SUPERIOR,
Geological Survey, Menlo Park, Calif.
W. R. Normark, and F. H. Dickson.
American Association of Petroleum Geologists Bulletin, Vol 60, No 7, p 1021-1036, July 1976. 10 fig, 1 tab, 30 ref.

Descriptors: *Sediment distribution, *Sedimentation rates, *Tailrace, *Mine wastes, *Lake Superior, Model studies, Lake morphology, Sedimentology, Cores, Sampling, Bottom sediments, Minnesota, *Path of pollutants.

Taconite ore tailings discharged into Lake Superior off Silver Bay, Minnesota, have formed a fan-like feature 20 sq km in area with a morphology and surface-sediment distribution comparable to that of many submarine fans. Two subparallel, leveed fan valleys extend across the upper fan from the base of a virtually unchannelled delta slope. The western fan valley is the deeper of the two, and its western or righthand (for the downstream direction) levee is higher and wider than its eastern levee, which is shared with the adjacent valley. Although both fan valleys terminate in low-relief suprafans, apparently the larger, western valley has been the primary pathway for sediments transported to the fan. The valleys give way to many small channels on the suprafans, which represent the only appreciable tailings deposition in the mid-fan area. Most of the tailings on the fan are silt-sized deposits that make up the levee complexes of the upper fan. The coarsest sediment (to coarse sand) is confined to the fan-valley floors and suprafan areas. Deposition has been insufficient to form the low half-cone physiography common to middle and lower fan segments on submarine fans. The growth pattern of Reserve fan is comparable to that of submarine fans off the California coast, primarily because of the wide range in grain size of sediment supplied (clay to coarse-pebble grade), and has developed in only 17 years owing to the very high rate of sedimentation, as much as 1.1 m/year on the upper fan. (Woodard-USGS)
W76-13079

FACTORS AFFECTING DECLINING WATER LEVELS IN A SEWERED AREA OF NASSAU COUNTY, NEW YORK,
Geological Survey, Albany, N.Y.
M. S. Garber, and D. J. Sulam.
Journal of Research of the U S Geological Survey, Vol 4, No 3, p 255-265, May-June 1976. 12 fig, 1 tab, 15 ref.

Descriptors: *Groundwater, *Drawdown, *Analog models, *Sewerage, *Water levels, Effects, *New York, Pumping, Sewers, Sewage treatment, Cesspools, Septic tanks, Groundwater movement, Hydrographs, Mass curves.
Identifiers: *Long Island(NY), *Water level declines.

Double-mass-curve analysis of ground-water levels in Nassau County, Long Island, N.Y., shows that the average-weighted ground-water levels in a 32 sq mi segment of a sewered area declined 11.8 ft relative to an adjacent unsewered area to the east during 1953-72. Electric-analog-model analysis indicates that 4.9 ft of the decline due to pumping in nearby Queens County, west the sewered area. Most of the remaining 6.9 ft the decline is due to sewering. Streamflow with the sewered area has also declined because of lowered ground-water levels. (Woodard-USGS)
W76-13084

A PRELIMINARY ASSESSMENT OF THE E VIRONMENTAL VULNERABILITY MACHIAS BAY, MAINE TO OIL SUPERTA KERS,
Massachusetts Inst. of Tech., Cambridge.
For primary bibliographic entry see Field 6G.
W76-13087

INPUTS OF PHOSPHORUS FROM PRECIPIT TION TO LAKE MICHIGAN,
DePaul Univ., Chicago, Ill.
T. J. Murphy, and P. V. Doskey.
Report EPA-600/3-75-005, December 1975. 35 fig., 10 tab., 25 ref. R-802647.

Descriptors: *Phospho *Precipitation(Atmospheric), *Lake Michig Rain, Phosphates, Hydrogen ion concentrati Snow, Fallout, Air pollution effects, *Path of lutants.

Samples of precipitation collected from six lo tions around Lake Michigan were analyzed for ferent forms of phosphorus. The atmospher presently contributing 1 million kilograms phosphorus per year or about 18% of phosphorus budget of the Lake. When phosphorus removal program on sewage efflu becomes fully implemented in the Lake Michi basin, the phosphorus contribution to the L from particulate matter scavenged by precipita could increase to about 30% of the total. average phosphorus concentration in precipita was about three times the 0.008 mg/l concen tion found in the Lake. The phosphorus concen tion in precipitation was higher at the south en the lake. Over 40% of the phosphorus in precip tion was dissolved reactive phosphate thus is mediately available to Lake organism. The amo of dissolved reactive phosphate in precipita was somewhat dependent on sample pH. Wash ratios for phosphorus by precipitation were de mined. Analysis of glacial samples indicated phosphorus has been a component of precipita for at least three centuries. Dry fallout also c tribute phosphorus to the Lake. Before filtra of samples for determination of dissolved reac phosphate, pH should be stipulated for equilib ing samples. (Buchanan-Davidson--Wisconsin)
W76-13112

QUALITATIVE AND QUANTITATIVE S MONELLA INVESTIGATIONS AND THEIR GIENIC VALUATION IN CONNECTION W E. COLI TITRE, DEMONSTRATED WITH AMPLES FROM THE COASTAL WATERS KIEL BIGHT (WESTERN BALTIC SEA), GERMAN),
Kiel Univ. (West Germany). Hygiene Institut.
For primary bibliographic entry see Field 5A.
W76-13140

DESCRIBING VARIANCE WITH A SIM WATER QUALITY MODEL AND HYPOTH CAL SAMPLING PROGRAMS,
Massachusetts Inst. of Tech., Cambridge. Dep Civil Engineering.
S. F. Moore, G. C. Dandy, and R. J. DeLucia.
Water Resources Research, Vol 12, No 4, p 804, August 1976. 7 fig, 2 tab, 18 ref.

Descriptors: *Water quality control, *Sampl *Decision making, Evaluation, Time, Hist Data collections, Estimating, Mathema models, Simulation analysis, Costs, Impo ments, Eutrophication, Equations, Systems an sis, *Risks.

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tifiers: Errors, Filtering theory.

explicit treatment of the uncertainty in the
of water quality in a body of water can pro-
a quantitative basis for sampling decisions.
ring theory, an extension of Bayesian analysis
namic systems, is used to obtain an algorithm
h describes the time history of variance
ertainty) in estimates of water quality parame-
Uncertainties arising from measurement er-
incompleteness of data, and random fluctua-
exhibited by natural phenomena are taken
account. Sampling design capabilities are il-
ated in an evaluation of sampling frequencies
the National Eutrophication Survey. The
uacy of any sampling program is dependent
ie available prior data and on the value as-
te with reductions in uncertainty. (Bell-Cor-

-13162

ELOPMENT AND APPLICATION OF A
TER RESOURCE ALLOCATION MODEL,
neering-Science, Inc., Berkeley, Calif.
rimary bibliographic entry see Field 5G.
-13168

CENTRATIONS OF MERCURY, CADMI-
LEAD AND COPPER IN THE SURROUND-
SEAWATER AND IN SEAWEEDS, UN-
IA PINNATIFIDA AND SARGASSUM FUL-
LUM, FROM SUYEONG BAY IN PUSAN,
OREAN),
n Fisheries Coll. (Republic of Korea).
rimary bibliographic entry see Field 5A.
13190

RACTERISTICS OF BOATS AS SOURCES
EA POLLUTION, (IN RUSSIAN),
tific Research Inst. of Water Transport Hy-
, Moscow (USSR).
Loranskii, B. M. Raskin, and N. N. Alfimov.
anit. 1, p 74-76, 1974.

riptors: *Oil pollution, Oil spills, Oil wastes,
er pollution sources, *Waste disposal,
s, *Waste treatment, Sea water, Ships.

sea pollution is caused by tankers discharg-
l-containing ballast waters in ports. Washing
kers and boat accidents are other sources of
ollution. Waste disposal from moored boats
bors leads to pollution of the coastal waters.
lations, devices and waste treatment
ds to prevent sea water pollution by boats
resented.--Copyright 1975, Biological Ab-
s, Inc.
13191

TTEMPT TO EVALUATE THE STATE OF
TH OF FISH FROM THE LYNA AND
ZA RIVERS IN CONNECTION TO THEIR
UTION, (IN POLISH),
imary bibliographic entry see Field 5C.
3192

TITATIVE DYNAMICS OF BACTERIA IN
KREMENCHUG RESERVOIR, (IN RUS-
,
miya Nauk URSR, Kiev. Instytut
biologii.
imary bibliographic entry see Field 5C.
3195

VAL OF TRACE ELEMENTS BY THE
TR RIVER, (IN RUSSIAN),
imary bibliographic entry see Field 5G.
3197

5C. Effects Of Pollution

SOME PHYSIOLOGICAL EFFECTS OF NEAR-MAXIMUM GROWTH TEMPERATURES ON AN OBLIGATELY PSYCROPHILIC MARINE BACTERIUM,
Oregon State Univ., Corvallis. Dept. of Microbiology.
G. G. Geesy, and R. Y. Morita.
Canadian Journal of Microbiology, Vol. 21, No. 6, 1975, p 811-818, 8 fig, 2 tab, 12 ref. NSF Ga 38583X.

Descriptors: *Physiological ecology, Animal physiology, Temperature, Thermal stress, Bacteria, Environmental effects.

Ant-300 is an obligate psychrophile, having a temperature optimum for growth of 7 C, and failing to grow above 13 C. Heat inactivation of the bacterium was investigated in terms of glucose uptake, the oxidation of glucose to carbon dioxide, and permeability control. Upon initiation of heat shock, carbon dioxide evolution from oxidation of glucose increased but as duration of shock continued, a decrease of glucose oxidation occurred. Data indicated that heat inactivation of cellular processes occurs at temperatures as low as 13 C. It was concluded that it was impossible to determine from these studies whether the time and temperature-dependent decrease in glucose accumulation was caused by heat-induced restrictions on the transport system mediating glucose uptake, or by loss of intracellular glucose through leakage. Data suggested that the cell envelope was damaged. (Chilton-ORNL)
W76-12681

AN ASSESSMENT OF NUCLEAR POWER PLANT WASTE HEAT UTILIZATION FOR FRESHWATER FISH FARMING,
Atomic Energy of Canada Ltd., Pinawa (Manitoba). Whiteshell Nuclear Research Establishment.
J. E. Guthrie, D. R. Prowse, and D. P. Scott.
AECL-4924, May 1975, 47 p, 8 fig, 1 tab, 19 ref, append.

Descriptors: *Aquiculture, Effluents, *Nuclear powerplants, *Fish farming, *Heated water, Cooling water, *Thermal pollution.

The feasibility and economic potential of aquaculture are investigated. The cooling water from nuclear power stations of one 600MW(e) reactor are reported to be adequate to achieve an annual production of at least 12 Gg of rainbow trout. A pilot plant is described which is designed to demonstrate public acceptance of product, continuous rather than batch production, control of fish diseases, suitability of alternative fish feeds, and rearing procedures for aquatic species other than rainbow trout. (Chilton-ORNL)
W76-12682

THERMAL RESPONSE OF HEATED STREAMS, SOLUTION BY THE IMPLICIT METHOD,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
For primary bibliographic entry see Field 5B.
W76-12685

SURVEY FOR RADIOACTIVITY IN A SWAMP,
Du Pont de Nemours (E. I.) and Co., Aiken, S.C. Savannah River Plant.
J. E. Johnson.
Available from the National Technical Information Service, Springfield, VA 22161 as DPSPU 75-30-8, $3.50 in paper copy, $3.00 in microfiche. DPSPU 75-30-8, Paper for presentation at the Third Environmental Protection Conference, September 23-25, 1975, held in Chicago, 10 p, 4 fig, 5 tab. AT(07-2)-1.

Descriptors: *Environmental effects, *Radioactivity, *Monitoring, *Swamps, South Carolina, Surveys, Pollutant identification.
Identifiers: Savannah River Plant(SC).

During periods of high water, Savannah River Plant effluents are diverted through a swamp and across the downstream plant boundary. An estimated 25 curies of cesium 137 and less than 1 curie of cobalt 60 have been deposited in an offsite location. Aerial and ground surveys indicated dose rates generally below 60 microR/hr. with a maximum of 120 microR/hr. Soil samples contained Cs137 ranging from less than 1 to 525 pCi/g in the top 7.5 cm. Vegetation contained from 1 to 235 pCi/g and wildlife from less than 1 to 15 pCi/g in edible tissue. Monitoring to date shows that the swamp sediments are immobile. No restrictions on use of the swamp are warranted. No increases in radioactivity are expected to occur but the swamp will be monitored annually to evaluate possible redistribution of the Cs137. (Chilton-ORNL)
W76-12689

THERMAL EFFECTS ON AQUATIC ORGANISMS, ANNOTATED BIBLIOGRAPHY OF THE 1974 LITERATURE.
Oak Ridge National Lab., Tenn.
Bibliography Report ORNL-EIS-75-28, 168 p, June 1975. Edited and Compiled by Coutant, C. C., Talmadge, S. S., Carrier, R. R. F., and Collier, B. N. W-7405-eng-26.

Descriptors: Documentation, *Bibliographies, *Thermal pollution, *Thermal stress, Temperature, *Water pollution effects, Publication, Water temperature.

This bibliography is the fourth in a series on the subject of thermal effects. It contains 570 references which are arranged alphabetically by first author. Indexes are provided for author, keywords, subject category, geographic location, taxon, and title (alphabetical listing of keyword-in-context of the nontrivial words in the title). Documents in which temperature is a variable or important to the experiment are included. Heat sterilization studies, laboratory studies that do not relate to the environment, and seasonal field studies with no specific mention of temperature are not included. (Chilton-ORNL)
W76-12692

EFFECTS OF 1973 RIVER FLOOD WATERS ON BROWN SHRIMP IN LOUISIANA ESTUARIES,
Louisiana Wildlife and Fisheries Commission, New Orleans. Div. of Oysters, Water Bottoms and Seafoods.
C. J. White.
Technical Bulletin No. 16, August 1975, 24 p, 18 fig, 26 ref.

Descriptors: *Environmental effects, *Floods, *Shrimp, *Estuaries, *Louisiana, Hydrology, Temperature, Salinity, Growth, Dispersion, Mortality.

Adverse hydrological conditions occurred along the Louisiana coast during March, April, and May of 1973 and were the result of record flood discharges, primarily from the Mississippi and Atchafalaya river systems. Local flooding existed on the many smaller rivers confluencing on the Louisiana coast to further compound the problem. Shrimp conditions that existed prior to the flood crisis were comparable to preceding years in areas of primary production. Hydrological conditions (salinity and temperature) that prevailed following the post larvae in 1973 were not conducive to brown shrimp growth, dispersal, and survival. This resulted in a considerable loss to the industry and the total impact should be felt for some time. (Chilton-ORNL)
W76-12693

CORRELATION OF RADIOACTIVE WASTE TREATMENT COSTS AND THE ENVIRONMENTAL IMPACT OF WASTE EFFLUENTS IN THE NUCLEAR FUEL CYCLE FOR USE IN ESTABLISHING AS LOW AS PRACTICABLE GUIDES-FABRICATION OF LIGHT-WATER REACTOR FUELS CONTAINING PLUTONIUM,
Oak Ridge National Lab., Tenn.
W. S. Groinier, R. E. Blanco, R. C. Dahlman, B. C. Finney, and A. H. Kibbey.
Available from the National Technical Information Service, Springfield, VA 22161, as ORNL-TM-4904, $6.75 in paper copy, $3.00 in microfiche. Report ORNL-TM-4904, May 1975, 140 p, 19 fig, 34 fig, 74 ref, append. W-7405-eng-26.

Descriptors: *Cost-benefit analysis, *Nuclear wastes, Model studies, Nuclear engineering, *Radioactivity, Plutonium, *Waste treatment, Cost analysis.
Identifiers: Fuel fabrication plants, Light water reactors.

This cost-benefit study uses a base case model plant which is representative of current plant technology and has an annual capacity of 300 metric tons of uranium and plutonium (as metal). Three conceptual gaseous radwaste treatment cases and their corresponding flowsheets were prepared for treating the wastes from the model plant. The base case represents the lowest cost and current practice. In each of the succeeding cases, gaseous radwaste treatment was added to accomplish specific objectives. The cost for the added waste treatment operations and the corresponding dose commitment are calculated for each case. Methodology for estimating the costs and the radiological doses, detailed calculation, and tabulations are presented. (Chilton-ORNL)
W76-12694

ENVIRONMENTAL STATUS OF THE LAKE MICHIGAN REGION, VOLUME 3. CHEMISTRY OF LAKE MICHIGAN,
Wisconsin Univ., Madison. Water Chemistry Lab.
M. S. Torrey.
Report ANL/ES-40, Vol. 3, May 1976, 418 p, 115 fig, 81 tab, 3 append, 431 ref. W-31-109-Eng-38.

Descriptors: *Data collections, *Chemistry, *Lake Michigan, Water quality, Effluents, Chemicals, Sediments, Water quality standards, Lake sediments, Lakes, Lake sediments.

Summarizes are presented chemical data collected in Lake Michigan and its two major embayments, Green Bay and Grand Traverse Bay, over the past twenty years. Concentrations of chemicals found in offshore waters which represent water quality least affected by man are compared with levels found in nearshore waters which in many cases have been appreciably altered by human activities. Concentrations of nutrients and toxicants are surveyed and compared with levels currently judged acceptable for the maintenance of human health and the propagation of desirable aquatic organisms. Sedimentary behavior of chemicals and external factors modifying the chemistry of the lake (erosion, weathering, municipal and industrial effluents, dry fallout and precipitation, and nonpoint surface and subsurface inputs) are considered. (Chilton-ORNL)
W76-12695

PRELIMINARY EVALUATION OF THE RADIOLOGICAL QUALITY OF THE WATER ON BIKINI AND ENEU ISLANDS,
California Univ., Livermore. Lawrence Livermore Lab.
V. E. Noshkin, K. M. Wong, R. J. Eagle, and G. Brown.
Available from the National Technical Information Service, Springfield, VA 22161 as UCRL-51971, $3.50 in paper copy, $3.00 in microfiche. Report UCRL-51971, December 1975, 19 p, 5 fig, 6 tab, 12 ref. W-7405-Eng-48.

Descriptors: *Water quality, *Path of pollutants, Water quality standards, Radiosotopes, Water wells, Groundwater, Water pollution.
Identifiers: Bikini Islands.

The objective of the survey repoted upon was to evaluate the potential radiation doses that could be received by persons returning to the islands of the Bikini Atoll. Data was obtained from water samples collected at old and new well sites on both Bikini and Eneu Islands and from the cistern water on Bikini Island. The radiological quality of the groundwater varied from one location to another on both islands. Assessment of the chemical quality of the ground water showed that, by U. S. Public Health Standards, the ground water at two stations on Eneu and one station on Bikini would be considered brackish; at one station on Eneu and two on Bikini it appeared to be potable; and at one station on Eneu and three on Bikini the water was chemically acceptable for drinking, household and agriculture purposes if the taste could be tolerated. The cistern water on Bikini Island was both chemically and radiologically acceptable as drinking water. On Eneu Island, the radionuclide concentrations varied among the ground water samples. Therefore, a complete dose assessment of all pathways must be completed before this water is recommended as usable. (Chilton-ORNL)
W76-12701

STUDIES OF COLUMBIA RIVER WATER QUALITY DEVELOPMENT OF MATHEMATICAL MODELS FOR SEDIMENT AND RADIONUCLIDE TRANSPORT ANALYSIS,
Battelle Pacific Northwest Labs., Richland, Wash.
For primary bibliographic entry see Field 5B.
W76-12702

THERMAL EFFECTS, (LITERATURE REVIEW),
Oak Ridge National Lab., Tenn.
C. C. Coutant, and S. S. Talmage.
Journal Water Pollution Control Federation, Vol. 48, No. 6, June 1976, p 1489-1544, 8 tab, 605 ref.

Descriptors: *Reviews, *Environmental effects, *Thermal pollution, Thermal stress, Thermal water, Aquatic life, *Bibliographies, Water pollution effects.

The 1975 literature pertaining to thermal effects on aquatic organisms is reviewed. Areas given attention include site studies, effects on growth and production, community responses, reproduction, development, morphology, distribution, thermal tolerance, oxygen metabolism, growth, feeding activity and digestion, temperature stresses, preferred temperature, predator-prey relations, decomposers, diseases and parasites, and beneficial uses. (Chilton-ORNL)
W76-12703

ON THE COEXISTENCE OF SCAVENGERS ON SHALLOW SANDY, BOTTOMS IN GULLMAR FJORD (SWEDEN), ADAPTATIONS TO SUBSTRATUM, TEMPERATURE, AND SALINITY,
Uppsala Univ. (Sweden). Inst. of Zoology.
S. Eriksson, S. Evans, and B. Tallmark.
ZOON, Vol. 3, 1975, p 65-70, 4 tab, 1 fig, 11 ref.

Descriptors: *Ecology, *Scavengers, Niches, Adaptation, *Temperature, *Salinity, Sands, Resistance, Bottom sediments, Fjords.
Identifiers: *Substratum, Gullmar Fjord(Sweden).

The adaptations of dominant scavengers to substratum, temperature, and salinity were investigated in the laboratory. Responses to substratum were studied in two-choice experiments and responses to temperature and salinity in tolerance experiments. Crangon vulgaris and Nassarius reticulatus principally chose soft substratum, Pagurus bernhardus and Asterias rubens L. preferred hard substratum with Carcinus maenas being intermediary between the groups in preference. Temperature tolera (100% survival) were ranked in the follo order Nassarius reticulatus (0-33 degrees C), cinus maenas (0-33C), Crangon vulgaris (0-2 Pagurus bernhardus (0-24C), and Asterias ru (0-22C). Salinity tolerances were ranked in the lowing decreasing order: Carcinus maenas 54%), Crangon vulgaris (3-45tb), N. reticulatu 45%), P. bernhardus (14-43%), and A. rubens 38%). The species showing the largest over-ca ty for this biotope were those preferring sha bottoms and soft substratum. (Chilton-ORNL)
W76-12704

PHYSIOLOGICAL ECOLOGY OF F POLYSIPHONIA SPECIES (RHODOPHY CERAMIALES),
New Hampshire Univ., Durham. Jac Estuarine Lab.; and New Hampshire Univ., ham. Dept. of Botany.
R. A. Fralick, and A. C. Mathieson.
Marine Biology, Vol. 29, 1975, p 29-36, 7 fig, 2 34 ref.

Descriptors: *Environmental eff *Distribution patterns, *Physiological eco Photosynthesis, Respiration, *Marine a Light, Temperature, Salinity, *Rhodophyta.
Identifiers: Ceramiales.

The effect of light, temperature and salinity photosynthesis and respiration of four marin algae were investigated. Cold water plants (a photosynthesis as low as 5 degrees C with photosynthesis at 21-24 C) showed signs of mal stress at temperatures of 25 C and a na tolerance to low salinities at high temperature peratures. Plants with warm water affinities or no photosynthesis below 10 degrees C and peak photosynthesis at 27-30 C) showed sig thermal stress at 30 C and had a wider toleran low salinities. Light optima for the four speci respect to their habitats, was comparable to intertidal and subtidal red algae. Horizontal tribution was primarily governed by tolerances to high temperatures and low salin Good correspondence was found between na distribution patterns and manometric re (Chilton-ORNL)
W76-12705

EFFECT OF WATER TEMPERATURE ON PREDATORY EFFICIENCY OF GAMBUSIA FINIS,
Bangalore Univ. (India). Dept. of Zoology.
S. R. Reddy.
Experientia, Vol. 31, No. 7, 1975, p 801-802, 1 tab, 11 ref.

Descriptors: *Environmental effects, *Water perature, *Fish behavior, Laboratory tests, Feeding rates, *Predation, *Livebearers, The pollution.

The magnitude of reduction in predatory effi cy depended upon sex and the physiological s of the fish. Predation increased with incre temperature (20, 25, or 30C) but was signif only for gestating females. Results indicate th affinis does respond thermotactically, and temperature appears to be the overriding stim that regulates the predatory efficiency. (Ch ORNL).
W76-12709

EFFECTS OF TEMPERATURE ON REFINERY WASTE TOXICITY,
Utah State Univ., Logan. Dept. of Civil and vironmental Engineering.
J. H. Reynolds, E. J. Middlebrooks, D. B. Porcella, and W. J. Grenney.
Journal Water Pollution Control Federation, 47, No. 11, November 1975, p 2674-2693, 73 re

UNIVERSITY OF ILLINOIS-CHAMPAIGN

criptors: *Industrial wastes, *Laboratory , *Oil wastes, Oil pollution, *Algae, Phenols, el studies, *Toxicity, Thermal pollution, r pollution effects.
tifiers: *Selenastrum capricornutum.

ntinuous flow kinetic model was developed to ribe and predict the effects of temperature on oxicity of a specific oil refinery waste to the Selenastrum capricornutum. The model was d on enzyme inhibition kinetics and was loped by using semicontinuous and continu- flow algal cultures grown at temperatures een 20 and 33 C. Phenol was the controlling ant. Phenol was more toxic to Selenastrum cornutum at 24 C than at either 20 or 28 C. increases the toxicity of phenol to the organ- Oil refinery waste was approximately 10 more toxic than pure phenol to S. capricor- n. (Chilton-ORNL)
12711

ELOPMENT OF A STUDY PLAN FOR NITION OF PCBS USAGE, WASTES, AND ENTIAL SUBSTITUTION IN THE INVEST- T CASTING INDUSTRY,
ar, Inc., Springfield, Va.
rimary bibliographic entry see Field 5G.
12713

ANNAH RIVER LABORATORY ENVIRON- TAL TRANSPORT AND EFFECTS EARCH, ANNUAL REPORT - FY 1975,
ont de Nemours (E.I.) and Co., Aiken, S. C. nnah River Lab.
rimary bibliographic entry see Field 5B.
12714

MIUM CONCENTRATIONS IN ROCK LLOPS IN COMPARISON WITH SOME ER SPECIES,
rnia Univ., Livermore. Lawrence Liver- Lab.
Vattuone, K. S. Griggs, D. R. McIntrye, J. tlepage, and F. L. Harrison.
able from the National Technical Informa- Service, Springfield, VA 22161 as UCRL- , $3.50 in paper copy, $3.00 in microfiche. t UCRL-52022, February 1976, 11 p, 5 tab, 1 ref. W-7405-Eng-48.

iptors: *Environmental effects, *Cadmium, f pollutants, Mussels, Shellfish, California. fiers: *Rock scallops, Santa Barbara(Calif), pa Islands(Calif).

mens of rock scallops and mussels were col- at Santa Barbara and Anacapa Islands. The s were compared for cadmium concentra- Data from the collections showed that con- tions in the total soft tissue were 16 times in the rock scallop than in the mussel. ed analysis showed the highest concentra- be in the digestive gland and stomach and west concentration in the adductor muscle. sults were confirmed by tracer experiments d 109. (Chilton-ORNL)
2715

TION OF WATER TEMPERATURE TO TOMYXOSIS IN RAINBOW TROUT IO GAIRDNERI) AND COHO SALMON ORHYNCHUS KISUTCH),
State Univ., Corvallis. Dept. of iology.
Jdey, J. L. Fryer, and K. S. Pilcher.
l of the Fisheries Research Board of a, Vol. 32, No. 9, 1975, p 1545-1551, 2 tab, 1 ef.

ptors: *Environmental effects, *Parasitism, parasites, Fish, Temperature, *Rainbow Salmon, Mortality.
iers: *Coho salmon.

Juvenile rainbow trout and coho salmon were exposed to infection with Ceratomyxosis shasta and then groups of the fish were held at various temperature levels increasing from 3.0 to 23.3C by 2.8C increments. Rainbow trout deaths did not occur at 3.9C but at the other experimental temperatures mortality averaged about 80% over a period of 237 days. No coho salmon deaths occurred at 3.9 or 6.7C but at other temperatures mortality increased progressively from 2% at 9.4C to 22% at 15.0C and 84% at 20.5C. The geometric-mean time from exposure to death in rainbow trout was a function of temperature increasing from 14 days at 23.3C to 155 days at 6.7C . The geometric-mean time from exposure to death of coho salmon increased from 12.5 days at 23.3C to 146 days at 9.4C. (Chilton-ORNL)
W76-12716

SUMMER DISTRIBUTION OF FISH SPECIES IN THE VICINITY OF A THERMAL DISCHARGE NEW RIVER, VIRGINIA,
Virginia Polytechnic Inst. and State Univ., Blacksburg.
J. R. Stauffer, Jr, K. L. Dickson, J. Cairns, Jr, W. F. Calhoun, and M. T. Masnik.
Archives of Hydrobiology, Vol. 76, No. 3, November 1975, p 287-301, 6 fig, 2 tab, 27 ref.

Descriptors: *Distribution patterns, *Fish, *Thermal pollution, Temperature, On-site investigations, Environmental effects, Water pollution effects, *Virginia.
Identifiers: *New River(Va).

By applying multivariate screening techniques to comprehensive in situ fish data the influence of temperature on fish distribution was evaluated. The results of the study indicated that temperature was extremely importat to distributional patterns. The stoneroller, northern hog sucker, and rosyface shiner all avoided temperatures above 80 F. The channel catfish demonstrated a preference for temperature exceeding 91F, while the distribution of the spotfin shiner appeared to be unaffected by temperature. (Chilton-ORNL)
W76-12717

SEASONAL ABUNDANCE AND DISTRIBUTION OF MARINE FISHES AT A HOT-WATER DISCHARGE IN GALVESTON BAY, TEXAS,
Texas A and M Univ., College Station. Dept. of Wildlife Science.
B. J. Gallaway, and K. Strawn.
Contributions in Marine Science, Vol. 18, 1974, p 71-137, 44 tab, 11 fig, 38 ref.

Descriptors: *Water pollution effects, *Thermal pollution, *Fish, Seasonal, *Distribution, Temperature, Effluents, *Texas, *Marine fish, Bays.
Identifiers: *Galveston Bay(Tex).

Biological and hydrological data were collected monthly from January 1968-December 1969 at 17 stations in the discharge area of the P. H. Robinson Generating Station. Discharge waters were usually about 8C warmer on the surface and 7.4C warmer on the bottom than bay water temperatures. Most species of fish appeared attracted to the effluent except during periods when temperatures were too hot. General reaction to this condition was avoidance until the effluent cooled. The lowest elevated temperature a species was observed to avoid was 30 C by Gulf menhaden. Cooling of effluent waters is not recommended for periods other than summer. The presence of warm water during winter is normally beneficial. It was concluded that with proper siting and design, power plants could be used as tools to enhance non-productive areas of Texas estuaries as nursery grounds. (Chilton-ORNL)
W76-12718

INFLUENCE OF TEMPERATURE ON SEXUAL DEFFERENTIATION IN CRUSTACEA, (TEMPERATURE ET DIFFERENCIATION SEXUELLE CHEZ LES CRUSTACES),
Centre National de la Recherche Scientifique, Gif-sur-Yvette (France). Laboratoire de Genetique Evolutive et de Biometrie; and Centre National de la Recherche Scientifique, St. Cloud (France). Laboratoire de Sciences Naturelles.
T. Ginsburger-Vogel.
Bulletin de la Societe Zoologique de France, Vol. 100, No. 1, 1975, p 95-115, 3 fig, 4 tab, 80 ref.

Descriptors: Environmental effects, *Temperature, Biology, Gonads, *Crustaceans.
Identifiers: *Sexual differentiation(Crustaceans).

Temperature influence on sexual differentiation was investigated on cyclical parthenogenesis of Cladocera, sex-ration abnormalities among Copepods, and monogeny and intersexuality in Amphipods. Temperature appeared to play a role for sex realization in Daphnia magna with low temperatures favoring the appearance of amphigonic females and high temperatures the appearance of males. In the preferential elimination of sex chromosomes during meiosis in the Cyclops viridis temperature was also significant. Monogeny and intersexuality existing in some populations of Orchestia gammarella depended on temperature during the breeding of females and their broods. Broods with female excess and intersex males are obtained at 17 C while normal broods or with excess of males are obtained at 22 C. (Chilton-ORNL)
W76-12719

EARLY SURVIVAL AND RECRUITMENT OF SMALLMOUTH BASS IN NORTHERN MICHIGAN,
Institute for Fisheries Research, Ann Arbor, Mich.
M. D. Clady.
Journal of Wildlife Management, Vol. 39, No. 1, 1975, p 194-200, 1 fig, 5 tab, 10 ref.

Descriptors: *Ecology, *Environmental effects, *Bass, *Mortality, Growth stages, Temperature, Fish, Age, *Michigan, Water pollution effects.

Survival for six life history stages from egg to fall fingerling were estimated for the 1967, 1968, and 1969 cohorts of smallmouth bass. Percentages of egg potentials deposited on nests ranged from 15 to 34%. Survival between egg deposition and post-larval stage ranged from 26-33%. Strength of year class was significantly correlated with summer temperatures when cohorts were measured later in life but not when year classes were measured at the end of the first year. This might suggest that weather is important in determining survival subsequent to September of the first growing season. (Chilton-ORNL)
W76-12720

MORTALITY OF THE EARLY DEVELOPMENTAL STAGES OF THE ROACH- RUTILUS RUTILUS (LINNAEUS, 1758),
Karlova Universita, Prague (Czechoslovakia). Dept. of Systematic Zoology.
K. Cerny.
Vestnik Ceskoslovenske Spolecnosti Zoologicke, Vol 39, No. 2, 1975, p 81-93, 2 fig, 2 tab, 39 ref.

Descriptors: *Ecology, *Environmental effects, Fish, *Mortality, Larvae, Water temperature, Water pollution effects.
Identifiers: *Roach larvae.

Data showed that mortality of roach larvae was closely associated with temperature, lowest mortality occurring at the highest temperature. An average temperature of 8.9 degrees C was unsuitable for development. At this temperature, the larvae had difficulties in filling the swim bladder, locomotion was slowed and ability to catch food was impaired. In starved larvae, the decline of larvae was faster at higher temperatures. A sudden

increase in mortality was observed during the first days following the final resorption of the yolk sac. It was concluded that increased mortality of fishes during the early developmental stages is the result of complicated interactions of a number of external ecological and internal factors and that it is impossible to infer which of these factors is the decisive one. (Chilton-ORNL)
W76-12721

SOME EFFECTS OF TEMPERATURE, CHLORINE AND COPPER ON THE SURVIVAL AND GROWTH OF THE COON STRIPE SHRIMP, PANDALUS DANAE,
Battelle Pacific Northwest Labs., Richland, Wash. Ecosystems Dept.; and Battelle Pacific Northwest Labs., Richland, Wash. Marine Research Lab.
C. I. Gibson, T. O. Thatcher, and C. W. Apts.
Report BNWL-SA-5344, 24 p, 3 tab, 2 fig, 12 ref.

Descriptors: *Environmental effects, *Mortality, *Growth rates, *Shrimp, *Water temperature, *Copper, *Chlorine, Thermal pollution, Water pollution effects, *Bioassay.
Identifiers: Critical Thermal Maximum.

From bioassays and growth rate experiments it was concluded that coon stripe shrimp are more resistant to chlorine when acclimated and exposed at 8-10 C than when acclimated at 8 C and exposed at 15-20 C or when acclimated and exposed at 15 C. The Critical Thermal Maximum increased with an increase in size and rate at which temperature was elevated. The optimal growing temperature for shrimp for periods up to one month was 16 C. Copper concentrations of 0.041 mg/1 retarded the growth at 16 C over a one month period. Chlorine concentration of 0.18 mg/1 was lethal at 16 C and reduced growth at 0.08 mg/1 over a one month period. (Chilton-ORNL)
W76-12722

SIMULATION EXPERIMENTS ON THE MIGRATION OF GAMMARUS ZADDACHI AND GAMMARUS CHEVREUXI,
Amsterdam Univ. (Netherlands). Inst. of Taxonomic Zoology.
H. B. Girisch, and H. G. Dennert.
Bijdragen tot de Dierkunde, Vol 45, No 1, 1975, p 20-38, 29 fig, 4 tab, 19 ref.

Descriptors: *Environmental effects, Migration, Aquatic animals, Diurnal, Temperature, Salinity, Tides, Currents(Water), Laboratory tests, *Fish migration.
Identifiers: *Gammarus zaddachi, *Gammarus chevreuxi.

A current chamber in which a tidal cycle could be simulated was used in the investigations of migratory activity of two species of Gammarus. The number of animals actively swimming against the current and the number drifting with the current was observed to be about equal. Migratory activity was influenced by population density and food supply as well as a diurnal periodicity. A combination of decreased current velocity followed by slow current in the opposite direction, with increased salinity and temperature caused a significant increase in activity of both species. An increase in one of these factors produced increased migratory activity to a lesser extent. No significant differences in migratory activities were seen between juveniles and adults. (Chilton-ORNL)
W76-12724

SPAWNING LITTORINA LITTOREA (L.) (GASTROPODA: PROSOBRANCHIATA),
University Coll. of North Wales, Menai Bridge. Marine Science Labs.
J. Grahame.
Journal of Experimental Marine Biology and Ecology, Vol. 18, 1975, p 185-196, 6 fig, 2 tab, 15 ref.

Descriptors: *Biology, *Biorhythyms, *Spawning, *Gastropods, *Snail, Tides, Tidal effects.

Snails were collected from about mean tidal level and transferred to the laboratory for observation. Data showed good evidence for seasonality of breeding in the snails studied as well as diurnal and longer time scale fluctuations in spawn output. There was no evidence of any immediate effects by temperature fluctuations of 2-3C nor was there any evidence that transfer to the laboratory entrained a spawning rhythm. There were strong indications of a lunar/tidal rhythm in spawning. (Chilton-ORNL)
W76-12725

GROWTH AND MORTALITY OF TWO GROUPS OF OYSTERS, (CRASSOSTREA VIRGINICA GMELIN), MAINTAINED IN COOLING WATER AT AN ESTUARINE ELECTRIC POWER GENERATING STATION,
Moody Coll. of Marine Sciences and Maritime Research, Galveston, Tex. Dept. of Marine Sciences.
G. H. Gilmore, S. M. Ray, and D. V. Aldrich.
Report TAMU-SG-75-207, January 1975, 67 p, 9 tab, 16 fig, 38 ref. NASA 04-3-158-18.

Descriptors: *Environmental effects, *Thermal pollution, *Oysters, *Growth rates, *Mortality, Ponds, Discharge(Water), Intakes, Powerplants, Cooling water, Water pollution effects.

Growth and mortality of oysters which were infected with Labyrinthomyxa marina was measured in samples collected from ponds receiving a continuous flow of heated water from an electric power plant, from the power plant intake canal, and from the power plant discharge canal. Pond oysters grew better and had less mortality than intake canal oysters regardless of infection. Highest infection occurred at the head of the discharge canal during warm seasons. Oysters held in the ponds grew as well or better than oysters from a natural reef. Evidence of oyster reproduction was also noted in the ponds. Oysters placed in the discharge canal during warm weather died within six weeks. (Chilton-ORNL)
W76-12726

EFFECT OF TEMPERATURE ON TOLERANCE TO DISSOLVED GAS SUPERSATURATION OF BLACK BULLHEAD, ICTALURUS MELAS,
Battelle-Northwest, Richland, Wash.
D. H. Fickeisen, J. C. Montgomery, and R. W. Hanf, Jr.
Report BNWL-SA-5175, CONF-741033-1 from a workshop on Gas Bubble Disease held in Richland, Washington, October 8, 1974, 10 p, 5 fig, 3 ref. AT(45-1)-1830.

Descriptors: *Environmental effects, *Gases, *Temperature, *Bullheads, Bioassays, *Supersaturation, Resistance, Water pollution effects, Thermal pollution.
Identifiers: Acclimation temperature, *Gas bubble disease.

A progress report on continuing work is presented. Fish were acclimated to test temperature (8, 12, 16, and 20 degrees C) prior to exposure to supersaturation. The data were subjected to probit analysis and mean 96-hour TL50 values were 126.7% of equilibrium saturation at 8 degrees C, 125.1% at 12 C, 123.8% at 16C, and 124.4% at 20 C, indicating a slightly elevated tolerance at the lowest test temperature. It was concluded that the effect of temperature within the range tested had little effect on tolerance of black bullhead acclimated to the test temperature. It was suggested that the combined effects of thermal shock and supersaturation might produce a different effect. (Chilton-ORNL)
W76-12727

REPRODUCTION AND RECRUITMENT THE BRACKISH WATER CLAM RANGIA NEATA IN THE JAMES RIVER, VIRGINIA,
Nuclear Regulatory Commission, Washin D.C. Div of Technical Review.
T. D. Cain.
Fishery Bulletin, Vol. 73, No. 2, 1975, p 412 17 fig, 2 tab, 34 ref

Descriptors: *Environmental eff *Temperature, *Salinity, Reproduc Spawning, Gonads, *Clams, Estuaries, Bra water, *Virginia.
Identifiers: Gametogenesis, *Rangia cu *James River estuary(Va).

The major objectives were to study gametogenic cycle of Rangia from histologica tions, to determine differences in gametog or spawning of clams over the species range James River estuary, to investigate the infl of temperature and salinity on initiatio gametogenesis and spawning, to corrob gametogenic findings by collecting newl clams, and to determine the duration of the period and differences in set abundance estuary. Correlation of environmental da gonadal conditions suggested that temperatu salinity are both important factors with s being more important in spawning while tem ture appeared to be the more important stimu initiating gametogenesis in the spring and su (Chilton-ORNL)
W76-12728

EXPERIMENTS AND OBSERVATIONS ON FEEDING BEHAVIOR OF THE FRESHW LEECH ERPOBDELLA OCTOCULATA (HIRUDINEA: ERPOBDELLIDAE),
State Univ. of New York Agricultural and T cal Coll. at Morrisville.
K. L. Greene.
Archives of Hydrobiology, Vol. 74, No. 1, 1 87-99, 1 fig, 3 tab, 10 ref.

Descriptors: *Environmental effects, *F rates, Behavior, Aquatic life, Temperature, Bottom sediments.
Identifiers: *Leeches(Feeding behavior).

Investigations were made under laboratory tions. Leeches were observed to find food b dom probing of the environment. Leeche sumed one or two chironomid larvae preferred prey) in each 24 hour perio generally rested after the second capture. V substrata conditions appeared to have less as leeches grew larger. Although leeches temperatures as low as 2 degrees C, feeding ty reached 60-70% and remained relativel stant between 7-12 degrees C. No endo rhythm could be found but it was observe feeding activity was greater at very low light sities. (Chilton-ORNL)
W76-12729

THERMAL EFFECTS ON THE ACCUM TION OF ARSENIC IN GREEN SUN LEPOMIS CYANELLUS,
Texas Univ. at Austin. Dept. of Zoology.
E. M. B. Sorensen.
Archives of Environmental Contaminatio Toxicology, Vol. 4, 1976, p 8-17, 5 fig, 20 ref

Descriptors: *Environmental e *Temperature, *Arsenic, *Sunfishes, Mo Thermal stress, *Thermal pollution, *Neut tivation analysis, *Pollutant identification.

Neutron activation analysis was used to m the pattern of arsenic concentration in tiss Lepomis cyanellus as a function of exposu at 10, 20, and 30 degrees C and with arsen centrations of 0, 30, and 60 ppm of sodi senate. The general trends of increasing uptake (in liver, gut and muscle) with inc

erature, arsenic concentration and time of ex-
e were apparent despite variability between
dual fish. Temperature quotient values for
c uptake in liver tissue had a mean of 4.5.
elevated values suggested that elevated heat
igh metal concentrations act synergistically
vy metal uptake. As temperature increased
0 to 20 to 30 C at 60 ppm of arsenic, percent
al was reduced so that 50% mortality values
ased from 678 to 210 to 124 hr. respectively.
enic concentrations of 30 ppm and tempera-
of 20 and 30 C, 50% mortality values were
d 209 hr., respectively. (Chilton-ORNL)
2731

RESPONSE OF LARVAL FISH,
TOMUS XANTHURUS, TO ENVIRON-
AL STRESS FOLLOWING SUBLETHAL
IUM EXPOSURE,
al Marine Water Quality Lab., Johns
S.C.
fiddaugh, W. R. Davis, and R. L. Yoakum.
outions in Marine Science, Vol. 19, 1975, p
2 fig, 3 tab, 16 ref.

ptors: *Environmental effects, *Cadmium,
, Fish, Thermal stress, Dissolved oxygen,
lity, *Lethal limit, *Toxicity, Water pollu-
fects.
iers: Critical thermal maximum,
tomus xanthurus.

ipient LC50 of 0.2-0.3 mg cadmium per liter
timated from previous data. In subsequent
erm sublethal exposures, concentrations of
m measured in respective treatment
were 0.09, 0.5, and 0.8 mg/l. At the 0.8
oncentration 20% of the larvae died by the
the 96 hour exposure interval. No deaths
d at exposure concentrations of 0.09 and
/l cadmium. Exposure of larval spot to
d temperature regimes or suppressed dis-
oxygen levels showed significant decreases
two factors at cadmium concentrations of
0.8 mg/l. Significant reduction in the capa-
larvae to survive thermal stress or low dis-
oxygen after exposure to sublethal concen-
of cadmium demonstrates the potential
ntal effect of this metal in the marine en-
ent. (Chilton-ORNL)
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REGULATION IN TRICHOCORIXA
CALIS INTERIORES SAILER
TERA, CORIXIDAE) - AN INHABI-
OF SASKATCHEWAN SALINE LAKES,
A,
hewan Univ., Saskatoon. Dept. of Biology.
es, and U. T. Hammer.
n Journal of Zoology, Vol. 53, No. 9, 1975,
212, 3 fig, 1 tab, 15 ref.

ors: *Laboratory tests, Biology, Osmosis,
Temperature, *Salinity, Environmental
*Canada, Saline lakes, Water pollution ef-

rs: *Osmoregulation, *Hemipterans,
orixa verticalis interiores.

calis interiores were collected from six
c saline lakes which represented a wide
salinities. The six lakes are all sulfate
which sodium and magnesium are the
tions. The maximum density of adults per
neter in the six lakes ranged from 2 to
ta from freezing point depression deter-
s of haemolymph showed that first in-
rd instars and adults of the species have
eloped osmoregulation and can hyporegu-
aline water. Although the species can
ulate equally well at 13, 20, and 25 degrees
ean tolerance limit decreases as the tem-
increases. (Chilton-ORNL)
3

DIATOM COMMUNITIES FROM A DELAWARE SALT MARSH,
Delaware Univ., Newark. Dept. of Biological Sciences.
M. J. Sullivan.
Journal of Phycology, Vol. 11, No. 4, 1975, p 384-390, 5 tab, 13 ref.

Descriptors: *Ecology, Water pollution effects, *Delaware, *Salt marshes, *Diatoms, On-site investigations, *Algae, Grasses, *Habitats, Temperature, Salinity, Distribution.

Edaphic diatoms were collected from 5 habitats of a salt marsh. Three of the habitats supported stands of grass while the other 2 were a bare bank and a panne. The habitats supporting grasses yielded the highest species diversity and the greatest number of diatoms. The bank and the panne were exposed to hypersaline conditions during warmer periods and this was considered a contributing factor to lower values for those habitats. The panne had the highest average temperature of the five habitats and the tall grass habitat had a surface temperature almost identical to the standing water temperature throughout the year. Each habitat supported its own unique and easily recognizable edaphic diatom community. Differences between the habitats were closely related to differences in temperature and elevation and to interactions between diatoms and filamentous algae. (Chilton-ORNL)
W76-12734

EFFECTS OF POLLUTION ON FRESHWATER FISH, (LITERATURE REVIEW),
National Water Quality Lab., Duluth, Minn.
J. M. McKim, D. A. Benoit, K. E. Biesinger, and W. A. Brungs.
Journal Water Pollution Control Federation, Vol. 47, No. 6, June 1975, p 1711-1768, 1 tab, 409 ref.

Descriptors: *Reviews, *Environmental effects, *Water pollution, Freshwater fish, Pollutants. Toxicity, Temperature, Water quality, *Bibliographies.

The effects of water pollution on freshwater is reviewed. Included in the review is information on methodology, water quality, pesticides, industrial pollutants, domestic and chlorinated pollutants and radioactive pollutants. A summary of the acute and chronic toxicity of inorganic and organic pollutants to freshwater fish, which provides information on species, exposure time, exposure type, temperature, effect endpoint, and concentration is provided. (Chilton-ORNL)
W76-12735

THERMAL EFFECTS, (LITERATURE REVIEW),
Oak Ridge National Lab., Tenn.
C. C. Coutant, and H. A. Pfuderer.
Journal Water Pollution Control Federation, Vol. 46, No. 6, June 1974, p 1477-1516, 8 tab, 23 ref.

Descriptors: *Reviews, *Thermal water, Thermal stress, *Thermal pollution, Aquatic life, Environmental effects, *Bibliographies, Water pollution effects.

The 1973 literature pertaining to thermal effects on aquatic organisms is reviewed. Categories to which particular attention is given include power plant studies, producers, reproduction, development, morphology, distribution, thermal tolerance, tissue and organ responses, oxygen metabolism, growth, feeding, predator-prey relations, diseases, beneficial uses, and other effects of thermal stress. (Chilton-ORNL)
W76-12736

CESIUM 137 ACTIVITIES IN FISH RESIDING IN THERMAL DISCHARGES TO LAKE MICHIGAN,
Argonne National Lab., Ill. Radiological and Environmental Research Div.
S. A. Spigarelli.
Health Physics, Vol. 30, May 1976, p 411-413, 1 fig, 1 tab, 12 ref.

Descriptors: *Environmental effects, *Water pollution effects, *Radioactivity effects, Radioecology, *Thermal water, Fish, Cesium, Salmonids, Chinook salmon, Rainbow trout, Brown trout, *Thermal pollution.

The goals of the study were to compare Cs 137 activities in plume resident fish with fish from unheated areas, to compare the residence effect on three important sport fish(brown trout, Rainbow trout, and Chinook salmon), and to evaluate the radioecological significance of thermal discharge residence on temporal trends in Cs 137 accumulation by salmonid fish in Lake Michigan. In 1973, the mean Cs 137 activities in plume fish were higher than those of reference fish for each species. However, covariance analysis showed no statistical difference between plume and reference samples of rainbow trout or chinook salmon; the mean Cs 137 activity of plume brown trout was significantly higher than the mean activity of reference brown trout. It is concluded that differences in Cs 137 activities between species may be the result of differential feeding habits or metabolic requirements. (Chilton-ORNL)
W76-12738

WARM WATER EFFLUENTS AND PLANKTON, (IN JAPANESE),
Seikai Regional Fisheries Research Lab., Nagasaki (Japan).
M. Anraku.
Bull Plankton Soc Jpn. 21(1), p 1-31, 1974.

Descriptors: Cyanophyta, Algae, Diatoms, Effluents, Microorganisms, *Diatoms, Primary productivity, *Phytoplankton, *Dionoflagellates, Fish, *Zooplankton, *Thermal pollution, *Succession, Chlorophyta.

The influence of warm water effluents on the ecology and physiology of phyto- and zooplankton in inshore water is reviewed. A change of species composition of phytoplankton was observed in the field and in experimental pools following the addition of warm water effluents. The diatom population may be replaced by green algae with gradual increase of temperature and succeeded by a population of blue-green algae. On certain occasions, diatoms give way to dinoflagellates with increasing temperature. Species diversity is heightened with temperature rise, and the biomass of a single cell also increases. Since diatoms are more important as foods of microorganisms than are other algae, the succession from diatoms to other algal populations may change pathways of energy flow in a stable food chain system and thus influence the ecosystem. Primary productivity is variable in thermal effluents. Increased water temperature has either an inhibitive or a stimulative effect on the productivity depending on the temperature of the intake water. The study of the influence of warm water effluents on the production of zooplankton should be continued after the installation of a power plant. The increase of warm water species may induce a decrease of cold water zooplankton. The change of species composition may affect the feeding of their predators, especially in the early developmental stages of fish. In general, rates of metabolism and activity of zooplankton increase with increasing temperature over most of the species-specific temperature tolerance range and decrease suddenly near the upper limit. The rates of increase are usually different for different species, and frequently for different biological processes. The temperature rise with heated effluents accelerates the metabolic rates within the range of tolerance. Patterns of

energy flow might also be altered by changes in body size of individual species caused by temperature changes.--Copyright 1975, Biological Abstracts, Inc.
W76-12740

EFFECTS OF ACCLIMATIZATION AND PHYSIOLOGICAL STATE ON THE TOLERANCE TO HIGH TEMPERATURES AND REACTIONS TO DESICCATION OF THEODOXUS FLUVIATILIS AND LYMNEA PEREGRA,
Stockholm Univ. (Sweden). Dept. of Zoology; and Stockholm Univ. (Sweden). Asko Lab.
G. Skoog.
Oikos, Vol. 27, 1976, p 50-56, 6 fig, 2 tab, 18 ref.

Descriptors: *Laboratory tests, Environmental effects, *Temperature, *Snails, Drying, Seasonal, Physiology, Resistance, *Thermal pollution.
Identifiers: *Lymnea peregra, *Theodoxas fluviatilis.

Laboratory experiments showed that both adult and juvenile Lymnea peregra were more tolerant to high temperatures than Theodoxus fluviatilis. Field distributions correborate the laboratory data. L. peregra exhibited a drastic drop in heat tolerance during the egg laying phase. Desiccicating conditions seem to be more hazardous to L. peregra as it is physiologically less tolerant to the effects of drying and dies sooner than T. fluviatilis. However, the behavioural response to desiccation including rapid movements offers a chance of reaching water which is not open to T. fluviatilis. (Chilton-ORNL)
W76-12741

TOXICITY OF NATURAL PYRETHRINS AND FIVE PYRETHROIDS TO FISH,
Fish and Wildlife Service, La Crosse, Wis. Fish Pesticide Research Unit.
W. L. Mauck, L. E. Olson, and L. L. Marking.
Archives of Environmental Contamination and Toxicology, Vol. 4, 1976, p 18-29, 5 tab, 23 ref.

Descriptors: *Laboratory tests, *Toxicity, *Pesticides, Environmental effects, Fish, Temperature, Hydrogen ion concentration, Salmonids, Channel catfish, Yellow perch, Minnows, Trout, Water pollution effects.
Identifiers: *Pyrethrins, *Pyrethroids.

The toxicity of natural pyrethrins and five pyrethroids was determined with coho salmon, steelhead trout, fathead minnow, channel catfish, bluegill, and yellow perch. The order of toxicity of pyrethrum extract and pyrethroids from most toxic to least toxic based on active ingredient was found to be RU-11679, SBP-1382, pyrethrum extract, S-bioallethrin, dimethrin, and d-trans allethrin. All the compounds were more toxic to cold water species. Pyrethrum extract and four of the pyrethroids were more toxic in cold water with d-tran allethrin being more toxic in warm water. Pyrethrum extract was more toxic in pH 6.5 than in high pH water. Pyrethroids were not influenced by pH in the range of 6.5 - 9.5. RU-11679 and SBP-1382 were most rapidly deactivated. Toxicity of dimethrin and d-trans allethrin was least influenced by temperature, water hardness and pH. (Chilton-ORNL)
W76-12742

FISH INVESTIGATIONS IN LONG ISLAND SOUND AT A NUCLEAR POWER STATION SITE AT SHOREHAM, NEW YORK,
New York State Dept. of Environmental Conservation, Albany.
For primary bibliographic entry see Field 2L.
W76-12743

CHARACTERIZATION OF THE FACTORS RESPONSIBLE FOR DEATH OF FISH INFECTED WITH VIBRIO ANGUILLARUM,
Delaware Univ., Newark. Dept. of Biological Sciences.
T. H. Umbreit, and M. R. Tripp.
Canadian Journal of Microbiology, Vol. 21, No. 8, 1975, p 1272-1274, 3 tab, 11 ref.

Descriptors: *Bacteriology, *Biochemistry, Toxins, Fish, Bacteria, *Heat, Mortality, Cultures, Toxicity, Water pollution effects.
Identifiers: *Vibrio anguillarum.

Experimental goldfish were injected intraperitoneally with live bacteria (Vibrio anguillarum) in culture medium; heat killed bacteria; supernatant fluid; and heated supernatant fluid. Fish injected with 10 to the 9th power live bacteria died within 6 days. Vibrios were most abundant in gills, liver, intestinal tract, and coelomic fluid. Fish injected with dead bacteria showed almost identical mortality rates as did those fish injected with the cell free supernatant. It was concluded that Vibrio anguillarum produces substances toxic for goldfish that are released from live bacteria and associated with heat-killed bacteria. Heating (100 C) enhances the potency of the extracellular toxin. (Chilton-ORNL)
W76-12745

MECHANISM OF DEATH AT HIGH TEMPERATURES IN HELIX AND PATELLA,
Trinity Coll., Dublin (Ireland). Dept. of Zoology.
J. N. R. Grainger.
Journal of Thermal Biology, Vol. 1, 1975, p 11-13, 2 tab, 15 ref.

Descriptors: Physiology, *Mortality, *Mollusks, Temperature, *Thermal stress, Sodium, Potassium, Thermal pollution, Water pollution effects, *Respiration.
Identifiers: Tissue respiration, *Helix, *Patella, *Na/K ratio.

Results of respiration measurements on tissues from normal and heat dead animals showed the oxygen consumption to be steady with no decline after 40 min. A significant fall in blood Na and a significant rise in blood K was observed in heat dead Helix demonstrating a major disturbance in the Na/K ratio. A significant disturbance in the Na/K ratio was also seen in Patella but this was entirely due to a rise in blood Na. These disturbances are thought to be a prime cause of heat death. (Chilton-ORNL)
W76-12746

RECENT CYCLIC CHANGES IN CLIMATE AND IN ABUNDANCE OF MARINE LIFE,
Marine Biological Association of the United Kingdom, Plymouth (England).
A. J. Southward, E. I. Butler, and L. Pennycuick.
Nature, Vol. 253, February 1975, p 714-717, 2 fig, 1 tab, 33 ref.

Descriptors: *Environmental effects, Meteorology, *Climatology, Marine fisheries, Oceans, Temperature, Fish populations, *Thermal pollution, Water pollution effects.

A review is presented of interactions between the sea, sea currents and the atmosphere which have important meteorological consequences and may also have direct or indirect effects on fisheries. Emphasis is placed on the effects of temperature on fisheries production. (Chilton-ORNL)
W76-12747

PHYTOPLANKTON GENERIC DIVERSITY AND BIOMASS ESTIMATES OF A MONOGAHELA RIVER ACID CONFLUENCE,
West Virginia Univ., Morgantown. Dept. of Biology.
D. Rankin, and E. C. Keller, Jr.
Proceedings of the West Virginia Academy Science, Vol. 45, No. 2, p 169-177, 3 tab, 1 app 16 ref.

Descriptors: *Environmental effects, *Water lution effects, Acidic water, *Acid streams, Pl ton, *Phytoplankton, Water quality, *Eugl *Biomass.
Identifiers: Monogahela River(WV).

The effects of acid drainage on water quality v a decrease in pH, a decrease in dissolved ox and percent saturation, and an increase in ho cold acidity levels. Aquatic organisms were f to be reduced in diversity and density Euglena being the only genus found. Reco was evidenced by an increase in generic dive and density and generally better water qu downstream from the confluence. (Ch ORNL)
W76-12748

FACTORS CONTROLLING RATES METHANE OXIDATION AND THE DISTR TION OF THE METHANE OXIDIZERS SMALL STRATIFIED LAKE,
Fisheries and Marine Service, Win (Manitoba). Freshwater Inst.
For primary bibliographic entry see Field 5B.
W76-12750

LATITUDINAL VARIATION IN THE LIFE TORY FEATURES OF THE BLACK TU SNAIL TEGULA FUNEBR (PROSOBRANCHIA: TROCHIDAE),
Oregon Univ., Eugene. Dept. of Biology.
P. W. Frank.
Marine Biology, Vol. 31, 1975, p 181-192, 1 tab, 32 ref.

Descriptors: *Ecology, *Environmental ef *Snails, *Latitudinal studies, Temperature, I tion, Aquatic populations, Density, abundance.

Identifiable factors that affect the life histo tributes of Tegula funebralis include lat population density as related to food supply ment and recruitment rate of young, and tion. This study was concerned with latitude an extent density. At higher latitude the s was found to live longer, grow more slowl attain a larger size than further south. Ag tribution was less predictable at higher lati These differences are explained by either perature effect together with increased haza planktonic larvae in the north or a combinat interactions between intensity of predation, lation density and food supply. Growth ra transplanted individuals suggested a genetic for the latitudinal differences. (Chilton-ORN W76-12751

FEEDING CHARACTERISTICS AND PR TION IMPACT OF CHAOBORUS (DIPT CHAOBORIDAE) LARVAE IN A SMALL L
Toronto Univ. (Ontario). Inst. for Environ Studies and Engineering.
For primary bibliographic entry see Field 2H
W76-12752

SPAWNING OF LAKE WHITE COREGONUS CLUPEAFORMIS, AND R WHITEFISH, PROSOPIUM CYLINDRAC IN AISHIHIK LAKE AND EAST AIS RIVER, YUKON TERRITORY,
Fisheries and Marine Service, Vancouver (Columbia). Vancouver Lab.
For primary bibliographic entry see Field 2H
W76-12754

BEHAVIORAL THERMOREGULATION HYPOPHYSECTOMIZED AND S

RATED RAINBOW TROUT, SALMO RDNERI,
ern Washington State Coll., Bellingham.
Frank, and M. E. Meyer.
vioral Biology, Vol. 11,1974, p 101-108, 3 fig, f.

riptors: *Environmental effects, Behavior, behavior, Temperature, Trout, Salmonids, ratory tests, *Rainbow trout, Water tempera- Thermal stress.
ifiers: *Thermoregulation.

rimental data indicated that both sham- ted and hypophysectomized rainbow trout able to reduce their mean water temperature lays through an increase in response rate and er of reinforcements. No significant dif- ce exists in the ability of the two to iorally regulate the ambient temperature. esults demonstrate that temperature varia- increased over days in hypophysectomized am-operated trout as compared to the nar- g of variability over sessions previously ob- l in normal and hypophysectomized rats. indings suggest a lack of hypophyseal in- ment in behavioral temperature regulation in ut. (Chilton-ORNL)
2755

EMENTS AND GROWTH OF ARCTIC LING (THYMALLUS ARCTICUS) AND NILE ARCTIC CHAR (SALVELINUS AL-) IN A SMALL ARCTIC STREAM, KA,
ic Environments Ltd., Crossfield (Alberta).
Craig, and V. A. Poulin.
l of the Fisheries Research Board of a, Vol. 32, No. 5, 1975, p 689-697, 4 fig, 1 ref.

ptors: *Fish behavior, *Ecology, Spawning, le fish, Fry, Streams, *Alaska, Growth Water pollution effects.

dy of fish utilization of a small stream was gated because of the liklihood that similar s in the north may be affected by roadways, es, and increased human activity. The served as a spawning and nursery area for grayling with adults entering the stream ter breakup and leaving after spawning. Ju- grayling and char entered the stream to rayling fry emerged from the gravel in late early July and remained until freeze-up. owth rate for grayling in the stream was o be faster than normal. (Chilton-ORNL)
756

ABILITY OF THE CICHLID FISHES A RENDALLE BOULENGER, TILAPIA MANII A. SMITH AND APLOCHROMIS OCRENILABRUS) PHILANDER (M.) TO ENTER DEEP WATER,
Univ., Grahamstown (South Africa) Inst. shwater Studies; and Rhodes Univ., stown (South Africa). Dept. of Zoology ology.
ulton.
of Fish Biology, 1975, Vol. 7, p 513-517, 2 , 5 ref.

ors: *Environmental effects, *Freshwater ichlids, *Tilapia, Pressure, Temperature, fish, Fry, Fish.

owed that adult T. rendalli compensated sure to a depth of 8.5 m and T. sparrmanii h of 15 m at 22 degrees C. The latter spe- ired a period of 8 days to descend to 15 m n to the surface if complete equilibration intained. Adult H. philander males com- to a maximum depth of 16 m at 22 C and 0 C, whereas the females descended to a 26 m at 22 C and 27 m at 30 C. Fry and juveniles were capable of descending to greater depths and were capable of more rapid depth compensation than were adults. (Chilton-ORNL)
W76-12759

THERMAL TRANSITIONS OF COLLAGEN FROM FISH RECOVERED FROM DIFFERENT DEPTHS,
Commonwealth Scientific and Industrial Research Organization, Sydney (Australia).
B. J. Rigby, and C. L. Prosser.
Comparative Biochemistry and Physiology, Vol. 52B, 1975, p 89-90, 2 tab, 7 ref.

Descriptors: Environmental effects, *Thermal stress, *Fish, Depth, Deep water, Shallow water, Temperature, Thermal pollution.
Identifiers: *Collagen.

Connective tissues which contain collagen as their main fibrous protein are known to exhibit thermal transition (due predominantly to the melting of molecular collagen) when heated. In dilute solution the collagen molecule undergoes a melting transition at a temperature which is characteristic of the species from which the collagen has been obtained. Melting temperature in acid of collagen from the skin of fish taken at 2000m depth with a habitat temperature of 2-4 C were 14 C; from flatfish taken at depths of 200m with a habitat temperature of 16-18 C were 25 C; and from reef fish with a habitat temperature of 24 C were 27 C. It was concluded that transition temperatures may correspond to lower and upper temperatures of the thermal preferendum. (Chilton-ORNL)
W76-12760

BEHAVIOR OF LOBSTERS (HOMARUS AMERICANUS) IN A SEMI-NATURAL ENVIRONMENT AT AMBIENT TEMPERATURES AND UNDER THERMAL STRESS,
Woods Hole Oceanographic Institution, Mass.
L. Stein, S. Jacobson, and J. Atema.
Report WHOI-75-48, October 1975, 49 p, 9 tab, 12 fig, 13 ref. AT(11-1) 3567 & E(11-1) 2546.

Descriptors: *Environmental effects, *Thermal stress, Laboratory tests, Behavior, *Lobsters, Temperature, Thermal pollution, Water pollution effects.

Identical semi-natural habitats in two 10 foot diameter, octagonal aquaria were established, each containing five lobsters. Behavioral observations were made during the day, following feeding and just after sunset (when lobsters are active under natural conditions) from February to August of 1974. Behavior patterns observed included shelter occupation, feeding, activity, and social behavior as exhibited by dominance, territoriality, mating, and aggression. Temperatures in the investigation ranged from 5 to 28 C. Patterns of residence and dominance in the lobsters changed seasonally. The direction of change was different in each tank and did not seem to be correlated with temperature. (Chilton-ORNL)
W76-12761

PERIPHYTON CROPS AND PRODUCTIVITY IN A REACTOR THERMAL EFFLUENT,
Du Pont de Nemours (E. I.) and Co., Aiken, S. C. Savannah River Lab.
L. J. Tilly.
Report DP-MS-74-77, For presentation at the 38th Annual Meeting of the American Society of Limnology and Oceanography, held in Halifax, Nova Scotia, June 23-26, 1975. 21 p, 6 fig, 4 tab, 7 ref. CONF-750668-1. AT(07-2)-1.

Descriptors: *Environmental effects, *Thermal pollution, *Periphyton, Biomass, *Productivity, Standing crop, Temperature, Water quality, Photosynthesis, Ponds.

Periphyton samples on glass slides were placed at 7 locations in Par Pond (encompassing high-to-ambient temperatures and protected-to-open water conditions) for two weeks. The samples were examined for differences in species composition, diversity, standing crop, and C 14 uptake. For stations with average temperature differences of less than 5 C, weight specific productivity differed by a factor of 7. Periphyton biomass differed more than fivefold between stations 5.5 C apart. Weight specific productivity and accumulated crop correlated highly with average growing temperature, but slopes of regressions from consecutive periods often differed greatly while species composition and temperature regime changed only slightly. (Chilton-ORNL)
W76-12762

METABOLIC STUDIES ON THE AMPHIPOD ANISOGAMMARUS PUGETTENSIS IN RELATION TO ITS TROPHIC POSITION IN THE FOOD WEB OF YOUNG SALMONIDS,
British Columbia Univ., Vancouver. Inst. of Oceanography.
B. D. Chang, and T. R. Parsons.
Journal of the Fisheries Research Board of Canada, Vol. 32, No. 2, 1975, p 243-247, 2 fig, 2 tab, 16 ref.

Descriptors: Ecology, *Food webs, *Metabolism, *Amphipoda, Temperature, Salinity, Growth rates, *Life cycles, Habitats.
Identifiers: *Anisogammarus pugettensis.

The purpose was to study Anisogammarus pugettensis' life cycle, metabolism, and food requirements in relation to its habitat and to investigate its potential as an organism for food for young fish. It was concluded that the principal advantage to the mass cultivation of this organism as opposed to many pelagic species would be its ability to tolerate a wide range of temperatures and salinities and to survive upon different kinds of food. At a salinity of 28% and a temperature of 20 degrees C, it grew at a rate of 14% of body weight per day. Growth efficiency was between 19 and 34%. (Chilton-ORNL)
W76-12763

TEMPERATURE RESPONSES OF A COCCOLITHOPHORID, CRICOSPHAERA CARTERAE, MEASURED IN A SIMPLE AND INEXPENSIVE THERMAL-GRADIENT DEVICE,
Duke Univ., Beaufort, N.C. Marine Lab.
For primary bibliographic entry see Field 5A.
W76-12764

COMBINED EFFECTS ON THE ENVIRONMENT OF RADIOACTIVE, CHEMICAL AND THERMAL RELEASES FROM THE NUCLEAR INDUSTRY, (REPORT ON THE INTERNATIONAL SYMPOSIUM HELD IN STOCKHOLM JUNE 2-5, 1975),
International Atomic Energy Agency, Vienna (Austria). Div. of Nuclear Safety and Environmental Protection.
P. J. West.
Atomic Energy Review, Vol. 13, No. 3, p 629-634.

Descriptors: Reviews, *Conferences, *Environmental effects, *Thermal pollution, Chemical wastes, *Radioactive wastes, Nuclear energy, *Radioactivity.
Identifiers: Synergism.

Papers presented at the symposium are reviewed. The majority of the papers were concerned with aquatic ecosystems and included the effects of temperature on radionuclide uptake, synergism and combination effects in aquatic systems, effects of chemical releases on radionuclide uptake, synergism and combination effects from releases to the atmosphere, and other factors in assessment of synergistic and combination effects. (Chilton-ORNL)
W76-12765

ANNULUS FORMATION AND GROWTH OF TIGERFISH, HYDROCYNUS VITTATUS, IN LAKE BANGWEULU, ZAMBIA,
Zambia Dept. of Fisheries, Samfya. Fishery Research Div.
J. S. Griffith.
Transactions of the American Fisheries Society, Vol. 104, No. 3, 1975, p 499-505, 3 tab, 4 fig, 12 ref.

Descriptors: *Environmental effects, *Temperature, *Aging(Biological), Fish, Growth rates, Growth stages, Lakes, Africa.
Identifiers: *Scale analysis, *Lake Bangweulu(Zambia).

The validity of scale analysis for aging tigerfish was assessed by examining the timing and cause of check formation on scales. Circuli which appeared to be valid annuli formed discontinuities on all scales under conditions of water temperature rising rapidly after a drop to 18 degrees C. The study does not indicate any other factors that could stimulate the formation of scale checks at the time these appeared. The lake level was dropping but did not reach a minimum until two to three months later and there was no indication that food availability decreased at the time of the check. (Chilton-ORNL)
W76-12767

THE EFFECTS OF POWER PLANT CONDENSER COOLING WATER ENTRAINMENT ON THE AMPHIPOD, GAMMARUS SP.,
New York Univ. Medical Center, N. Y. Lab. for Environmental Studies.
T. C. Ginn, W. T. Waller, and G. J. Lauer.
Water Research, Vol. 8, 1974, 937-945, 6 fig, 4 tab, 14 ref.

Descriptors: *Environmental effects, *Thermal pollution, Mortality, *Amphipoda, Entrainment, Cooling water, Powerplants, Temperature, Water pollution effects.
Identifiers: *Gammarus sp.

Mean per cent survival of Gammars sp. sampled during temperature rises of 7.1-8.3C at ambient temperatures of 24.9-26.0C was 98.5 and 97.4% for two intake stations and 90.1 and 96.8 for the two discharge stations. Increased initial and latent mortalities were observed during periods of condenser chlorination. Mean intake abundances were about an order of magnitude higher at night than during the day. Thermal tolerance of Gammarus sp. appeared to be dependent on exposure time and ambient temperature. Temperatures causing a 50% mortality for 30 min. exposure times increased about 11C as ambient temperatures increased 2.5 to 25.8C. (Chilton-ORNL)
W76-12768

THERMAL EFFECTS OF POWER PLANT ENTRAINMENT ON SURVIVAL OF FISH EGGS AND LARVAE: A LABORATORY ASSESSMENT,
State Univ. of New York at Stony Brook. Marine Sciences Research Center.
J. R. Schubel, T. S. Y. Koo, and C. F. Smith.
Chesapeake Bay Institute, Special Report 52, Reference 76-4, PPRP-13, 38 p, May 1976, 9 tab, 2 fig, 34 ref, append.

Descriptors: *Environmental effects, *Thermal pollution, *Fish eggs, Larvae, Temperature, *Entrainment, Resistance, Mortality, Laboratory tests, Freshwater fish, Striped bass, Herrings, Shad.

Blueback herring, American shad, and striped bass eggs and larvae were subjected to time-excess temperature histories typical of those experienced by organisms entrained by power plants with a variety of design and operating criteria. Excess temperatures ranged from 7-20C above base temperature, exposure time from 4-60 minutes, and cooling time from 60-300 minutes. Excess temperatures of 20C resulted in almost 100% mortality to eggs of all three species. Analyses of variance indicated that excess temperature exposures of 15C significantly reduced the hatching success of blueback herring and American shad eggs but not of striped bass eggs. Excess temperatures of 20C also caused almost 100% mortality of larvae in all three species. Striped bass larvae could withstand excess temperatures of up to 10C with no significant increase in mortality. (Chilton-ORNL)
W76-12769

SITE AND DESIGN TEMPERATURE RELATED ECONOMICS OF NUCLEAR POWER PLANTS WITH EVAPORATIVE AND NON-EVAPORATIVE COOLING TOWER SYSTEMS,
Gilbert Associates, Inc. Reading, Pa.
For primary bibliographic entry see Field 6G.
W76-12784

MAP SHOWING LAKES IN THE GREATER DENVER AREA FRONT RANGE URBAN CORRIDOR, COLORADO,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 7C.
W76-12795

LAKES IN THE COLORADO SPRINGS--CASTLE ROCK AREA, FRONT RANGE URBAN CORRIDOR, COLORADO,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 7C.
W76-12797

ANALYSIS OF MULTIPLE CELL MECHANICAL DRAFT COOLING TOWERS,
Pacific Northwest Environmental Research Lab., Corvallis, Oreg.
L. R. Davis.
Report EPA-660/3-75-039, June 1975, 38 p, 7 fig, 17 ref.

Descriptors: *Model studies, *Mathematical models, *Cooling towers, *Thermal pollution, Cooling water.

A mathematical model capable of calculating plume rise and dilution from multiple cell mechanical draft cooling towers with the wind normal to the tower line is presented. Calculation techniques are included for the zone of flow establishment, the zone of fully developed single plumes, the zone of merging multiple plumes and the zone of completely merged plumes. The entrainment functions presented include the effects of plume interference and variable entrainment surfaces on merging. Coefficients in the entrainment function must be determined from suitable field or laboratory data. The report version is for dry plumes but equations and modifications required to convert to moist plumes are included. (Chilton-ORNL)
W76-12848

EFFECT OF METEOROLOGICAL VARIABLES ON TEMPERATURE CHANGES IN FLOWING STREAMS,
Pacific Northwest Environmental Research Lab., Corvallis, Oreg.
R. W. Troxler, Jr, and E. L. Thackston.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-240 285, $5.00 in paper copy, $3.00 in microfiche. Report EPA-660/3-75-002, January 1975, 83 p, 24 fig, 5 tab, 5 ref, 3 append. R-800613.

Descriptors: *Model studies, *Mathematical models, *Forecasting, *Water temperature, Streams, Meteorology, Water pollution effects.

A mathematical model to be used in predicting water temperature changes in a flowing stream as a function of stream geometry and weather information was developed and tested. Measurements were made on cold water from power station warmed moving downstream over periods of 38 hours. Data on which the/temperature ch were made were obtained from a boat floatin the water, a station on the bank and a re weather station 100 miles away. Difficultie countered in predictng stream temperature weather data from stations other than in the valley required modifications to account fo climatological differences between the two tions. It was concluded that highly acc weather predictions are difficult to obtain an predictions determined by the model can o as accurate as the weather data used for inpu model studied appears to be a useful tool. (Ch ORNL)
W76-12849

CHARACTERISTICS OF THE TOXIC EF OF PROPYLPHENOL ISOMERS AND T SAFE LEVEL IN WATER BODIES, (IN SIAN),
Estonskii Institut Eksperimentalnoi i Klinich Meditsiny, Tallinn (USSR).
I. A. Veldre, K. K. Norman, and V. P. Saliev
Gig Sanit. 7, p 94-96, 1974.

Descriptors: *Toxicity, *Phenols, Rodents collections, Organoleptic properties.
Identifiers: *Isomers, Maximum allowabl centrations, *Propylphenol isomers, *Perc threshold concentrations.

Data on the toxicity of p-and 0-propylphen white mice, white rats and guinea pigs and p tion threshold concentrations (PTC) are pres The PTC for 0-propylphenol was 0.01 mg/ respect to odor before and after heatin chlorination of the water; the PTC propylphenol was 0.025 mg/1 with respect t and taste before water processing and odo water processing. The organoleptic index iousness of both isomers was the more se index. The maximum allowable concentra both isomers in water bodies is 0.01 mg/1. right 1975, Biological Abstracts, Inc.
W76-12850

THE EVAPORATION AND DEGRADATI N-NITROSO DIMETHYL AMINE IN AQU SOLUTIONS,
Air Force Civil Engineering Center, K AFB, N. Mex.
For primary bibliographic entry see Field 5E
W76-12852

THE ENVIRONMENTAL IMPACT OF W CHLORINATION.
Oak Ridge National Lab., Tenn.
CONF-751096, Proceedings of a conferen at Oak Ridge, Tennessee on October 22-24 443 p. Jolley, R. E., Ed.

Descriptors: *Conferences, *Environmen fects, *Chlorination, *Waste water treatme ganic compounds, Model studies, Fore Chemistry, Chlorine, *Water treatment.

The conference was organized and condu members of the U.S. Environmental Pro Agency, the Energy Research and Devel Administration and the Biology, C Technology, and Environmental Science sions of the Oak Ridge National Laborato proceedings contains 18 papers on the con subject. The general subject areas inclu aqueous chemistry of chlorine, biomedical of chloroorganics, environmental transport fects, and modeling and prediction. (Se 12877 thru W76-12895) (Chilton-ORNL)
W76-12876

CURRENT CHLORINATION DECHLORINATION PRACTICES IN

TMENT OF POTABLE WATER, WASTE-
ER, AND COOLING WATER,
imary bibliographic entry see Field 5D.
2877

CHEMISTRY OF AQUEOUS CHLORINE
LATION TO WATER CHLORINATION,
rd Univ., Cambridge, Mass. Div. of En-
ng and Applied Physics.
lorris.
-751096, In: Proceedings of the Conference
Environmental Impact of Water Chlorina-
eld in Oak Ridge, Tennessee on October 22-
5. p 27-41, 1 fig, 1 tab, 15 ref.

ptors: *Chlorine, Aqueous solutions,
cal reactions, Chemcontrol, Organic com-
, *Waste water treatment, Forecasting,
ination, Water chemistry.

variety of molecular and ionic species
ed when chlorine is dispersed in water,
is the dominant species. When HOCl reacts
lectrophilic reagent at oxygen, chloride ion
ed by displacement. When the reaction is at
N or at carbon the electrophilic attack is by
orine atom. Other forms of electrophilic at-
e of chloramination, of chlorophenol for-
or other aromatic substitution, of addition
le bonds, and of haloform formation. Thus,
concluded that the reactions of aqueous
e in water chlorination follow well-defined
ys in accord with general principles of or-
eaction mechanisms. Even when the exact
ition of the organic material in a water or
ater is not known, it is still possible to pre-
nething of the nature and extent of the
is with aqueous chlorine to be anticipated.
o W76-12876) (Chilton-ORNL)
878

REMENT AND PERSISTENCE OF
INE RESIDUALS IN NATURAL
ES,
Carolina Univ. at Chapel Hill. Dept. of En-
ntal Sciences and Engineering.
nary bibliographic entry see Field 5A.
879

O-CHEMICAL IMPLICATIONS OF
CHLORINATION,
ota Univ., Duluth. Dept. of Chemistry.
rlson, and R. Caple.
751096, In: Proceedings of the Conference
Environmental Impact of Water Chlorina-
d in Oak Ridge, Tennessee on October 22-
p 73-83, 6 fig, 2 tab, 10 ref.

ors: *Environmental effects, *Water pol-
Chlorine, *Waste water treatment, Waste
Organic compounds, *Chlorination,
y, Forecasting.

stigation of the dilute aqueous chlorina-
ypical compounds known to be present in
bjected to chlorine renovation indicates
rine is readily incorporated into the car-
ework by a pathway that is predomi-
nic. The study considers the relationship
nistic processes to pH, product distribu-
D, oxidative capacity and chloramine for-
The use of the basic principles of
tic chemistry provides for an element of
ility of the environmental impact result-
the chlorination process. (See also W76-
hilton-ORNL)
80

NATION OF ORGANICS IN DRINKING

l Environmental Research Lab., Cincin-
. Water Supply Research Div.
vens, C. J. Slocum, D. R. Seeger, and G.
k.

CONF-751096, In: Proceedings of the Conference on the Environmental Impact of Water Chlorination, held in Oak Ridge, Tennessee on October 22-24, 1975. p 85-114, 12 fig, 15 ref.

Descriptors: *Environmental effects, *Water pollution effects, *Potable water, *Water treatment, Water quality, *Chlorination, Organic compounds, Chemistry, Public health.

Trihalomethanes, potential health hazards, are formed during the chlorination step of the water treatment process. Some factors influencing trihalomethane production (precursor compound concentration, pH, type of disinfectant used, and temperature) are investigated. The precursor to trihalomethane is identified as a complex mixture of humic substances and simple low molecular weight compounds containing the acetyl moiety. The relative importance and contribution to trihalomethane production of each of the specific precursor compounds are pH dependent. The point of chlorination in the treatment process, being a significant factor in trihalomethane production, probably represents the most important variable to be considered for change in attempts to reduce ultimate trihalomethane concentrations in finished drinking water. (See also W76-12876) (Chilton-ORNL)
W76-12881

CHLORINATION OF ORGANICS IN COOLING WATERS AND PROCESS EFFLUENTS,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 5A.
W76-12882

ANALYSIS OF NEW CHLORINATED ORGANIC COMPOUNDS FORMED BY CHLORINATION OF MUNICIPAL WASTEWATER,
North Texas State Univ., Denton. Inst. of Applied Sciences.
For primary bibliographic entry see Field 5A.
W76-12883

CHEMISTRY OF HALOGENS IN SEAWATER,
Rosentiel School of Marine and Atmospheric Science, Miami, Fla.
For primary bibliographic entry see Field 5A.
W76-12884

HALOGENATED ORGANICS IN TAP WATER: A TOXICOLOGICAL EVALUATION,
Health Effects Research Lab. Cincinnati, Ohio.
R. G. Tardiff, G. P. Carlson, and V. Simmon.
CONF-751096, In: Proceedings of the Conference on the Environmental Impact of Water Chlorination, held in Oak Ridge, Tennessee on October 22-24, 1975. p 213-227, 7 tab, 18 ref.

Descriptors: *Environmental effects, *Toxicity, Chlorination, Organic compounds, Potable water, Public health, *Halogens, Chlorine.
Identifiers: Mutagenesis, Carcinogensis, Teratogenesis.

Surveys revealed that approximately 34% of the organic compounds found in drinking water are halogenated and that approximately 50% of the volatiles found in drinking water are halogenated. Assessment of these compounds requires consideration of degree of exposure, intrinsic toxicity of the agents, interactions among compounds and with other environmental factors, and species sensitivity. A program aimed at the toxicologic definition of the chlorinated hydrocarbons is described. Two approaches are taken; (a) that dealing with bioscreen of mixtures or organic compounds for mutagenesis, chronic toxicity/carcinogenesis, and teratogenesis; and (b) that dealing with specific chlorinated hydrocarbons or classes of these compounds, with specific emphasis on comparative metabolism for prediction of human responses and on interactions for predictions of synergism and antagonism. (See also W76-12876) (Chilton-ORNL)
W76-12885

ORIGIN, CLASSIFICATION AND DISTRIBUTION OF CHEMICALS IN DRINKING WATER WITH AN ASSESSMENT OF THEIR CARCINOGENIC POTENTIAL,
National Cacer Inst., Bethesda, Md.
H. F. Kraybill.
CONF-751096, In: Proceedings of the Conference on the Environmental Impact of Water Chlorination, held at Oak Ridge, Tennessee on October 22-24 1975. p 229-246, 5 tab, 42 ref.

Descriptors: *Environmental effects, *Public health, Chemicals, Potable water, Organic compounds, Chlorination, Distribution, Path of pollutants.
Identifiers: *Carcinogens.

Of the 235 chemicals in drinking water, 21 were characterized as having carcinogenic activity. Four of the chemicals listed are recognized carcinogens, the remaining are classified as suspect. Not all chemicals classified as having carcinogenic potential or activity can be assessed as to their equivalent hazard. Some chemicals may be characterized as potential carcinogens on the basis of structural relationships or ancillary studies on mutagenicity. The integrated insult from multiple carcinogens may have additive or inhibitory properties. The levels of the carcinogenic organics are in the parts-per-trillion and parts-per-billion range. (See also W76-12876) (Chilton-ORNL)
W76-12886

THE POTENTIAL FOR INCREASED MUTAGENIC RISK TO THE HUMAN POPULATION DUE TO THE PRODUCTS OF WATER CHLORINATION,
Oak Ridge National Lab., Tenn.
R. B. Cumming.
CONF-751096, In: Proceedings of the Conference on the Environmental Impact of Water Chlorination, held in Oak Ridge, Tennessee on October 22-24, 1975. p 247-258, 2 tab, 11 ref.

Descriptors: Environmental effects, *Water treatment, *Chlorination, Potable water, Organic compounds, Chlorine, Public health, Laboratory tests.
Identifiers: *Mutagenesis.

A chemical (5-chlorourcil) which is known to be produced by water chlorination and to be present in drinking water was tested in several mammalian and submammalian genetic test systems. Data for incorporation studies into the DNA of mice together with specific-locus mutation data allow calculation of the upper 95% confidence limit for mutations induced in the human population at environmental exposure levels. This calculation demonstrates that the chemical in question does not, by itself, pose a significant genetic hazard to humans at current release levels. Data is not available on whether or not all of the chlorine-containing organic compounds produced by water chlorination pose a significant hazard. (See also W76-12876) (Chilton-ORNL)
W76-12887

THE EPIDEMIOLOGIC APPROACH TO THE EVALUATION OF WATER-BORNE CARCINOGENS,
National Cancer Inst., Bethesda, Md.
K. P. Cantor.
CONF-751096, In: Proceedings of the Conference on the Environmental Impact of Water Chlorination, held in Oak Ridge, Tennessee on October 22-24, 1975. p 259-274, 3 tab, 16 ref.

Descriptors: *Epidemiology, Water treatment, *Environmental effects, *Water pollution, Chemicals, Disease, Human diseases, Human populations, *Public Health.

Identifiers: *Carcinogens.

Epidemiologic studies are valuable because they are made directly on human populations making extrapolation from animal models and/or unrealistically high doses unnecessary in predicting effects on humans. Epidemiologic studies for cancer have limitations which include the long latent period for most cancers, difficulties in estimating dose, the definition of at-risk populations, and the relatively low exposure levels to carcinogens. The report lists a number of substances which have been identified as carcinogens (mustard gas, radiation, vinyl chloride monomer, B-Naphthylamine, benzidine, asbestos and smoking, asbestos, and cigarettes) and strongly linked to specific sites in the human body. So-called latent periods for most of the listed carcinogens are also indicated as well as the relative risk where it has been estimated. (See also W76-12876) (Chilton-ORNL)
W76-12888

THE TOXICITY OF CHLORINE TO FRESHWATER ORGANISMS UNDER VARYING ENVIRONMENTAL CONDITIONS,
Wisconsin Univ., Milwaukee. Center for Great Lakes Studies.
A. S. Brooks, and G. L. Seegert.
CONF-751096, In: Proceedings of the Conference on the Environmental Impact of Water Chlorination, held in Oak Ridge, Tennessee on October 22-24, 1975. p 277-298, 66 ref.

Descriptors: *Environmental effects, *Toxicity, *Chlorine, Aquatic life, Freshwater, Water pollution effects, Fish, Temperature, Water quality.
Identifiers: Exposure time, Dose rates.

Chlorine enters freshwater systems under a wide variety of environmental conditions including wide ranges of temperature, water quality, and variable application times and dose rates. The literature is reviewed in an attempt to evaluate the influence of these variables with respect to the toxicity of chlorine to freshwater organisms. It was concluded that the response of freshwater organisms to chlorine is species dependent and that the life stage and size of an organism is an important factor in the toxicity of chlorine. Exposure time and chlorine concentrations are critical in determining the final response of organisms. Temperature effects appear to be species dependent and also dependent on the specific temperature range concerned. The avoidance of chlorine by fish was demonstrated in the laboratory. (See also W76-12876) (Chilton-ORNL)
W76-12889

A REVIEW OF THE IMPACT OF CHLORINATION PROCESSES UPON MARINE ECOSYSTEMS,
Gulf Breeze Environmental Research Lab., Wadmalaw Island, S.C. Bears Bluff Field Station.
W. P. Davis, and D. P. Middaugh.
CONF-751096, In: Proceedings of the Conference on the Environmental Impact of Water Chlorination, held in Oak Ridge, Tennessee on October 22-24, 1975. p 299-325, 2 fig, 3 tab, 53 ref.

Descriptors: *Environmental effects, *Chlorination, *Water pollution effects, Sea water, Ecosystems, *Reviews, Model studies.

This paper presents a theoretical degradation model of chlorine added to marine waters and summarizes the literature on laboratory investigations and ecological effects of chlorine. The theoretical degradation model progresses through five levels to stable end products (Cl and Br ions) through a diverse group of mechanisms operative in the steps. (See also W76-12876) (Chilton-ORNL)
W76-12890

CHLORINATED COMPOUNDS FOUND IN WASTE-TREATMENT EFFLUENTS AND THEIR CAPACITY TO BIOACCUMULATE,
Minnesota Univ., Duluth. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W76-12891

INVESTIGATING THE EFFECTS OF CHLORINATED ORGANICS,
Oak Ridge National Lab., Tenn.
C. W. Gehrs, and G. R. Southworth.
CONF-751096, In: Proceedings of the Conference on the Environmental Impact of Water Chlorination, held in Oak Ridge, Tennessee on October 22-24, 1975. p 347-362, 2 fig, 2 tab, 12 ref.

Descriptors: *Environmental effects, *Water pollution effects, *Chlorination, *Organic compounds, Fish, Zooplankton, Carp, Daphnia, Mortality, Hatching, Mature growth stage.

Toxicity studies were conducted using the zooplankter Daphnia magna and the fish Cyprinus carpio. The parameters used were mortality and maturation in the zooplankter and hatching success (mortality) and malformation of fry for the fish. Two chlorinated compounds (5-chlorouracil and 4-chlororesorcinol) and a mixture of identified chlorinated organics were the chemicals tested. 5-chlorouracil caused no change in median survival times at concentration up to 1 mg/l. Both 4-chlororesorcinol and the synthetic mixture produced discernible changes in median survival times over the ranges tested. All concentrations of 4-chlororesorcinol and concentrations of 5-chlorouracil above 0.1 mg/l caused at least a 50% decrease in the number of young produced during the first seven days of free life in the zooplankter. Both 5-chlorouracil and 4-chlororesorcinol were found to have significantly lower hatching success of carp eggs at concentrations as low as 0.01 mg/l. The breakpoint of toxicity of the synthetic mixture was approximately 30 mg/l. A positive correlation has been seen between concentration of 5-chlorouracil and percent malformation in carp with a linear dose-response relationship originating at 0.5 mg/l. No similar response was found for either 4-chlororesorcinol or the synthetic mixture. (See also W76-12876) (Chilton-ORNL)
W76-12892

MODELING RESIDUAL CHLORINE LEVELS: CLOSED CYCLE COOLING SYSTEMS,
Industrial Environmental Research Lab., Cincinnati, Ohio.
G. R. Nelson.
CONF-751096, In: Proceedings of the Conference on the Environmental Impact of Water Chlorination, held in Oak Ridge, Tennessee on October 22-24, 1975. p 365-385, 5 fig, 4 tab, 13 ref, 2 append.

Descriptors: *Model studies, *Mathematical models, *Chlorine, Cooling towers, Chlorination, Water pollution sources.
Identifiers: Residual chlorine, Chlorine levels, Blowdown.

The mathematical model discussed in this paper predicts residual chlorine levels in cooling tower blowdown streams at any time during the chlorination cycle. Program characteristics of the general model include split stream vs no split stream chlorination, residual data feedback vs no residual data feedback, and positive vs negative demand at the end of the chlorine feed period. Split stream refers to the fraction of the recirculating water chlorinated; residual data feedback to the type of chlorine feed equipment used; and positive or negative demand to the time length of the chlorine feed period. There are eight variations to the model which apply to specific chlorination program characteristics. (See also W76-12876) (Chilton-ORNL)
W76-12893

A KINETIC MODEL FOR PREDICTING COMPOSITION OF CHLORINATED WA DISCHARGED FROM POWER PLANT C ING SYSTEMS,
Oak Ridge National Lab., Tenn.
M. H. Lietzke.
CONF-751096, In: Proceedings of the Confe on the Environmental Impact of Water Chl tion, held at Oak Ridge, Tennessee on Octob 24, 1975. p 387-401, 2 tab, 26 ref, append.

Descriptors: *Model studies, *Mathem models, *Forecasting, *Chlorination, F plants, Chemistry, Cooling water, Path of tants.

The model, which is in the process of de ment, will contain three rate equations: the tion of hypochlorous acid with ammonia, the tion of hypochlorous acid with an organic and the further reaction of hypochlorous aci monochloramine. The simultaneous diffe equations will be solved mathematically to g composition of the water as a function of (See also W76-12876) (Chilton-ORNL)
W76-12894

ASSESSING TOXIC EFFECTS CHLORINATED EFFLUENTS ON AQU ORGANISMS: A PREDICTIVE TOOL,
Oak Ridge National Lab., Tenn.
J. S. Mattice.
CONF-751096, In: Proceedings of the Conf on the Environmental Effects of Water Ch tion, held in Oak Ridge, Tennessee on Octo 24, 1975. p 403-422, 2 tab, 3 fig, 44 ref.

Descriptors: *Environmental effects, *Mo dies, *Mathematical models, *Forec *Chlorination, Effluents, Aquatic life, *Tox

The tool proposed in this paper includes le exposure and concentration as factors portance and allows for protective limitat be applied to releases on a site specific Acute and chronic mortality threshol derived by (1) summarizing extant chlorine ty data in log concentration-log duration pl bounding these data points from belo straight lines to estimated acute and chroni an lethal thresholds, and (3) shifting the median lethal threshold to estimate a true ty threshold using an empirically derived r ship between exposure time necessary t fifty and zero percent mortality. Yes or n sions concerning mortality are derived by c ing these thresholds with dose-time expos entrained organisms. (See also W76 (Chilton-ORNL)
W76-12895

EFFECT OF THE OPERATING COND OF RECYCLING WATER SUPPLY SY ON THE QUALITY OF REUSED WATERS, (IN RUSSIAN),
Vsesoyuznyi Nauchno-Issledovatelskii Vodosnabzheniya, Kanalizatsii, Gi nicheskikh Sooruzhenii i Inzh Gidrogeologii, Moscow (USSR).
P. P. Markov, and M. V. Kozlova.
Gig Sanit. 38(11), p 103-105, 1973.

Descriptors: *Recycling, Water supply, quality, *E. coli, Fouling, Bacteria, *Co Operations, *Microorganisms, *Pathoge teria, Evaporation, Temperature.
Identifiers: *Biological fouling, *Saprophy

The main factors influencing the surv microorganisms in recycled water (the nu times it is evaporated and temperature) w died in an experimental plant. The magn the coliform index of recycled water sho with an increase of temperature and nu times the water is evaporated the survival Escherichia coli decreases. The operatin

s of the cooling system of the recycling water
ly system stimulate the development of
gical fouling of the system by bacteria due to
ncrease of the number of saprophytes in the
cled water in comparison with the added
r, and improves the sanitary state of the recy-
water as a result of reducing the survival of
ogenic microorganisms.--Copyright 1975,
gical Abstracts, Inc.
-12907

CONDUCT OF CERTAIN LONG-LIVED
TOPES IN ROCKS IN THE CASE OF THEIR
TAMINATION WITH NONTECHNICAL
LUENTS OF THE ATOMIC ELECTRIC
ER STATIONS (AES), (IN RUSSIAN),
rimary bibliographic entry see Field 5B.
12908

CT OF SUSPENDED COAL PARTICLES
LIFE FORMS OF AQUATIC MOSS EUR-
CHIUM RIPARIOIDES (HEDW): II. THE
CT ON SPORE GERMINATION AND
ENERATION OF APICAL TIPS,
rsity Coll., Cardiff (Wales). Dept. of Botany.
wis.
water Biol. 3(4), p 391-395, 1973.

iptors: *Mosses, *Coal mine wastes, Ger-
ion, Spores, Suspended solids, Plant growth,
th stages.
fiers: *Eurhynchium-Riparioides,
neration, Rhizoidal, Coal dust, Apical tips.

quatic moss E. riparioides is capable of living
the discharge from a coal washery effluent.
ffect of coal dust on the reproducing powers
iparioides is described. The percentage ger-
on of the spores of E. riparioides is reduced
% in the presence of 5000 mg/l of suspended
articles, but with decrease in coal dust con-
tion, there is an increase in the amount of
nation. The effect of suspended coal dust on
generation from detached apical tips of E.
ides is discussed; rhizoidal growth occurs in
concentration of coal dust including 5000
although the development of new side
in observed only in concentrations below
g/l.--Copyright 1974, Biological Abstracts,

2913

TS OF CHEMICAL POLLUTANTS ON
MEDIATORS INTERVENING IN THE
OBIOLOGICAL AND PLANKTONIC
OGY IN A MARINE ENVIRONMENT: III,
ENCH),
d'Etudes et de Recherches de Biologie et
nographie Medicale, Nice (France).
ndo, and M. Aubert.
Oceanogr Med 39/40, p 109-116. (1974).

tors: *Chemical wastes, *Microbiology,
on, Ecology, Diatoms, Pesticides, Deter-
Organic compounds, Industrial wastes,
Carbon, Water pollution effects, Aquatic

rs: *Asterionella-Japonica, *Peridinium
leum, *Telemediators.

of research on the effects of chemical pol-
n telemediators affecting microbiological
ktonic microbiology, the action of chemi-
utants (hydrocarbons, detergents, pesti-
dustrial sewages and metals) on a growth
of a marine diatom Asterionella japonica
by Peridinium trochoideum was studied.
these pollutants have a positive action on
hanism in lower, sublethal concentrations.
W73-10095)--Copyright 1976, Biological
s, Inc.
22

ENTS, (LITERATURE REVIEW),
Univ., Columbia.

S. K. Banerji.
Journal Water Pollution Control Federation, Vol. 48, No. 6, p 1110-1115, June, 1976. 27 ref.

Descriptors: *Detergents, *Surfactants, *Water pollution effects, *Waste water treatment, *Aquatic environment, Algae, Fish, Anions, Cations, Biological treatment, Phosphates, Carbonates, Nutrients, Phosphorus, *Reviews, *Bilbiographies.
Identifiers: Whitening agents, *Literature reviews.

A literature review of the effects of detergents on waste water treatment processes and the aquatic environment is presented. Topics covered include: the effects of a ban on detergent phosphates on stream nutrient levels, the effects of detergent phosphorus on the growth of different species of algae, the effects of surfactants on fish, the accumulation and elimination of detergent whitening agents in bluegill, the degradation of anionic surfactants in artificial waste water media, the effects of cationic detergents on microorganisms in biological treatment plants, and the effects of carbonate detergents on biological waste treatment. (Kreager-FIRL)
W76-12925

THE ECOLOGY OF ALGAE IN THE MORUYA RIVER, AUSTRALIA,
Bath Univ. (England).
I. C. Potter, D. Cannon, and J. W. Moore.
Hydrobiologia, Vol. 47, No. 3-4, p. 415-430, 1975. 6 fig, 3 tab, 24 ref.

Descriptors: *Australia, *Algae, Varieties, Succession, Dominant organisms, Herbivores, Seasonal, Standing crops, Benthic flora, Plankton, Diatoms, Chlorophyta, Scenedesmus, Lampreys, Ammocetes, *Ecology.
Identifiers: *Moruya River(Australia).

Studies of the Moruya River, Australia, indicated little scouring of the substrate. Turbidity and color were low and pH was slightly above neutral with no seasonal variation. Silicates were high. Calcium, nitrates, and silicates were seasonally static. Dissolved oxygen was always near saturation. Compared to northern hemisphere rivers, standing crops of benthic and planktonic algae were low. Diatoms always accounted for more than 90% of algae in sediments; the most common species were typical of holarctic flora. At all sampling sites, the relative abundance of the six predominant algal genera was similar. Gomphonema was more abundant downstream and Cocconeis placentula upstream. The largest standing crop was downstream in the calmest part of the river from January-March, coinciding with maximum wate temperatures. Downstream a true phytoplankton succession of filamentous chlorophytes, Scenedesmus, Melosira varians, Dactylococcopsis, Eudorina, and Merismopedia was observed in the spring and summer and a maximum standing crop in December. Guts of larval lampreys (larger than 100 mm) contained large numbers of algal cells. Scenedesmus and Dactylococcopsis were found more frequently in the guts than in sediment or water; however the reverse was true for filamentous algae. Ammocetes did not appear to significantly affect the algal standing crop. (Buchanan-Davidson--Wisconsin)
W76-12934

SIGNIFICANCE OF CELLULAR NITRATE CONTENT IN NATURAL POPULATIONS OF MARINE PHYTOPLANKTON GROWING IN SHIPBOARD CULTURES,
Centre Universitaire de Luminy, Marseille (France). Laboratoire d'Oceanographie.
Y. Collos, and G. Slawyk.
Marine Biology, Vol. 34, No. 1, p. 27-32, 1976. 1 fig., 3 tab., 32 ref.

Descriptors: *Nitrates, *Marine algae, *Metabolism, *Absorption, *Diurnal, Cultures, Denitrification, Sea water.
Identifiers: *Intracellular nitrate, Particulate nitrogen.

To study the significance of intracellular nitrate in controlling nitrate assimilation by marine phytoplankton and to understand relationships between nitrate uptake and reduction, phytoplankton intracellular nitrate concentrations were monitored in experiments on shipboard cultures of surface sea water from an upwelling region. Measurements were related to parameters of biomass (particulate nitrogen) and nitrate assimilation using nitrogen-15 isotope and nitrate reductase assays. Cellular nitrate was determined by filtering sea water, grinding in deionized water, centrifuging, and measuring nitrate in the supernatant in an autoanalyzer. Cellular nitrate concentrations exhibited diurnal variations (3.1-206 mg-at nitrate per microgram-at particulate nitrogen). These could be correlated positively with nitrate reductase activity. Nitrogen budgets indicated that nitrate reductase activity represented only 12% of nitrate incorporation in organic phytoplankton material when nitrate was present in sea water. When environmental nitrate was depleted (zero uptake), nitrate reductase activity completely accounted for internal nitrate decrease. Internal nitrate contents were better indices of nitrate consumption by marine phytoplankton than external nitrate-nitrogen concentrations, since no quantitative relationship was found between sea water nitrate and nitrate reductase activity. Diurnal variations in metabolism may be as important in phytoplankton competition and succession as temporal variations of environmental parameters. (Buchanan-Davidson--Wisconsin).
W76-12936

LAKE GEORGE SITE SYNTHESIS, 1974-1975.
Rensselaer Polytechnic Inst., Troy, N.Y. Fresh Water Inst.
N. L. Clesceri, C. W. Boylen, D. C. McNaught, L. S. Clesceri, and R. A. Park.
Report FWI 75-15 (EDFB 75-7), (1975). 16 p. 20 ref. NSF BMS 69-01147 A09.

Descriptors: *Computer models, *Lakes, *Primary productivity, *Secondary productivity, Research and development, Rooted aquatic plants, Degradation(Decomposition), *New York, Predation, Crustaceans, Algae, Grazing, Zooplankton, Fish, Cycling nutrients.
Identifiers: *Lake George(NY), Model CLEAN, Model CLEANER.

Synthesis activities at the Lake George site during 1974-1975 are reviewed. Primary productivity modeling centered on development and implementation of a submodel to estimate rooted macrophyte productivity, which permitted input of data not previously accessible by the submodel WEED. To measure secondary productivity, a resource allocation-predation model was rebuilt, calibrated, and validated for herbivorous crustaceans. Selective grazing on natural algal assemblages by zooplankton was studied and a technique developed to examine size-selective grazing. The resource allocation-predation model permits assessment of effects of predator populations on zooplankton production in Lake George or other oligotrophic-mesotrophic lakes. The model suggests the importance of selective predation in regulating zooplankton production. Laboratory studies of selective feeding helped understand mechanisms of selective grazing. The glucose assimilatory activity of water columns and sediments was measured. Conversion factors were developed to give data collected during decomposition more ecological realism and make it more useful for models. Synthesis efforts resulted in validation, documentation, and evaluation of sensitivity of the models CLEAN and CLEANER. The model is valid for mesotrophic and eutrophic conditions, but is too sensitive to changes in certain parameters, so further modeling should focus on representation of adaptive shifts in environmental response. (Buchanan-Davidson--Wisconsin).
W76-12937

FLUCTUATIONS OF PHYTOPLANKTON BIOMASS AND ITS COMPOSITION IN A SUBARCTIC LAKE DURING SUMMER
Toronto Univ. (Ontario). Dept. of Botany.
R. G. Sheath, M. Munawar, and J. A. Hellebust.
Canada Journal of Botany, Vol. 53, p. 2240-2246, 2 fig., 1 tab., 22 ref.

Descriptors: *Fluctuations, *Phytoplankton, *Biomass, *Subarctic, *Lakes, Canada, Summer, Chlorophyta, Diatoms, Dominant organisms, Algae, Succession, Dinoflagellates, Varieties, Nannoplankton, Benthic flora, Chrysophyta.
Identifiers: Norman Wells(N.W.T.), Subarctic lakes.

Phytoplankton fluctuations, succession of algal taxa, net plankton and nannoplankton, and comparisons of phytoplankton and benthic algae were studied in a small subarctic lake located near Norman Wells, Northwest Territories, Canada. During the ice-free period, phytoplankton biomass increases were observed; peaks were observed early in July and late in August. Chlorophyta and Diatomaceae were dominant during periods of high biomass, this was not due to wind stirring of benthic forms. Other algal groups only showed relative increases during the minima. The early summer population was almost entirely diatoms, followed by mixed populations of diatoms and cryptomonads; Chlorophyta were dominant in midsummer; and then there were successive increases in chrysomonads, dinoflagellates, and finally diatoms. Fluctuations in major species were studied in relation to changes in algal group biomasses. Net plankton species were dominant (accounted for more than 50% of the total) most of the summer. Nannoplankters were only abundant for short periods from mid-June to July. Phytoplankton species composition in July was dissimilar to that of benthic algae since only 15% of the species were common to both habitats, and these species contributed to 23% of the estimated phytoplankton biomass. The source of common species is not known. (Buchanan-Davidson--Wisconsin).
W76-12938

ULTRASONIC REMOVAL OF EPILITHIC ALGAE IN A BARCLAMP SAMPLER,
Ichthyological Associates, Inc., Berwick Pa.
For primary bibliographic entry, see Field 5A.
W76-12939

AN AUTOMATED ASSAY FOR THE DETERMINATION OF NITRATE REDUCTASE IN MARINE PHYTOPLANKTON,
Centre Universitaire de Luminy, Marseille (France). Laboratoire d'Oceanographie.
G. Slawyk, and Y. Collos.
Marine Biology, Vol. 34, No. 1, p. 23-26, 1976. 5 fig., 13 ref.

Descriptors: *Denitrification, *Analytical techniques, *Marine algae, *Assay, Metabolism, Enzymes, Nitrites, Nitrates, Automation, *Bioassay, *Pollutant identification.
Identifiers: *Nitrate reductase.

An automated assay was developed to determine nitrate reductase activity in marine phytoplankton. This enzyme can be used as an index of the rate of nitrate-nitrogen assimilation in phytoplankton. The enzymes were extracted manually with phosphate buffer from cells in seawater, but the successive steps of substrate addition, incubation, stopping of the reaction, adding of reagents for nitrate measurement, and absorbance reading were done automatically using a Technicon AutoAnalyzer. This was compared with a manual method, using samples from the euphotic zone and shipboard cultures. Results obtained with the two methods were in good agreement; a correlation coefficient of 0.96 was calculated from the data. The automated method can handle up to twenty samples an hour, thus helping to overcome the difficulty of making frequent observations when studying diurnal variations of phytoplankton metabolic activities. It permitted the simultaneous handling of other measurements when enzyme extraction was completed. Results should also be more reproducible. Nitrate reductase activity and changes in nutrient concentrations, biomass, and assimilation rates were measured over a 14-hour period in shipboard cultures and in diatom batch cultures. (Buchanan-Davidson--Wisconsin).
W76-12940

THE INFLUENCE OF GIBBERELLIC ACID AND KINETIN ON THE GROWTH OF SCENEDESMUS QUADRICAUDA (TURP.) BREB.,
Wroclaw Univ. (Poland). Dept. of Experimental Botany.
J. Buczek, G. Kubik-Dobosz, and E. Tatkowska.
Acta Societatis Botanicorum Poloniae, Vol. 44, No. 3, p 415-421, 1975. 3 tab, 12 ref.

Descriptors: *Algae, *Scenedesmus, *Growth rates, Proteins, Cultures, Biomass.
Identifiers: *Harmones, *Gibberellic acid, *Kinetin.

The influence of gibberellic acid and kinetin (6-furfurylamino purine) on Scenedesmus quadricauda growth was studied. Gibberellic acid (0.0000001 M) significantly increased algal dry weight after 6 and 12 days growth, but not after 18 days; it had no effect on protein content; and increased the number of cells after 6 and 12 days, but not after 18 days. Kinetin (0.000001 and 0.0000001 M) increased dry weight about 22% after 12 days, and increased the protein content, especially during the initial phase of algal growth. Kinetin (0.000001 M) increased cell multiplication on all days by more than 30% and caused significant increases in cell division rates throughout the culture period. The lower kinetin concentration enhanced cell division after 12 days culture and prolonged intensive algal growth. The presence of these substances was not necessary for Scenedesmus growth. Gibberellic acid only stimulated cell multiplication and dry weight during the intensive growth phase; after that stage the mass and quantity of cells were the same as controls. Kinetin only affected cell division during the initial growth stage; affected dry weight after 12 days; and prolonged the ability of the cells to divide, thus extending the intensive growth phase. (Buchanan-Davidson--Wisconsin)
W76-12941

EFFECT OF ENVIRONMENTAL FACTORS ON PHOTOSYNTHESIS PATTERNS IN PHAEODACTYLUM TRICORNUTUM (BACILLARIOPHYCEAE). I. EFFECT OF NITROGEN DEFICIENCY AND LIGHT INTENSITY,
University Coll. London (England).
H. Glover, J. Beardall, and I. Morris.
Journal of Phycology, Vol. 11, No. 4, p 424-429, 1975. 1 fig, 7 tab, 16 ref.

Descriptors: *Biochemistry, *Marine algae, *Photosynthesis, *Diatoms, *Carbon, *Nitrogen, *Light intensity, Absorption, Deficient elements, Measurement, Amino acids, Carbon dioxide, Environmental effects.
Identifiers: *Phaeodactylum tricornutum, Carbon fixation.

During short-term carbon-14-carbon dioxide photoassimilation in cultures of the marine diatom Phaeodactylum tricornutum, much of the total fixed carbon was incorporated into amino acids and amides. Increasing nitrogen limitation in a nitrogen-limited chemostat affected radioactivity distribution in individual compounds but had no significant effect on the proportion of carbon incorporated into amino acids and amides together. Increased nitrogen deficiency reduced the proportion incorporated into amides, reduced the proportion of alanine, increased the amount of glutamic acid, increased the proportion of carbon assimilated into tricarboxylic acid cycle intermediates and decreased the relative synthesis of sugar phosphates. Reduced light intensities did not significantly affect the proportion of carbon incorporated into total amino acids and amides, decreased the radioactivity assimilated into glycine and serine and increased that assimilated into alanine. It is possible that the incubation was too long and the products were secondary products or that carboxylation of C-3-compounds to C-4-carboxylic acids of the tricarboxylic acid cycle was more important in Phaeodactylum than other algae. The significance of the facts that reduced light intensities and increased nitrate deficiency did not change the relative carbon incorporation into combined amino acids and amides but caused changes in the relative importance of certain compounds is discussed. (Buchanan-Davidson--Wisconsin)
W76-12942

WATER QUALITY INVESTIGATIONS I SMALL ARTIFICIAL RESERVOIR,
Arkansas Dept. of Commerce, Little Rock. D Soil and Water Resources.
J. W. Moore.
Report July 1973. 166 p, 105 fig, 2 ref, 16 appe

Descriptors: *Physical properties, *Water qu *Chemical properties, *Reservoirs, *Biol communities, *Arkansas, Dissolved ox Water supply, Alkalinity, Iron, Biochemica ygen demand, Manganese, Carbon dioxide takes, Nitrogen, Hardness(Water), Algae, Taste, Outlets, Reaeration, Hydrogen ion co tration, Specific conductivity, Water temper Flood control, Water treatment.
Identifiers: Prairie Grove Lake(Ark), I River(Ark), Blair Creek(Ark).

Selected water quality parameters were mon over a three year period on Prairie Grove La small impoundment on Muddy Creek Fork Illinois River near Prairie Grove, Ark. Periods of zero dissolved oxygen in lower tions of such reservoirs can be expected i area, which vary in duration with reservoir and ambient air temperature. During these p high iron and manganese concentrations c troublesome; they are not high enough to ca jection of the raw water source, but requir sideration in water intake and treatment f design. Algal growth may cause periodic tas odor problems. Feasibility of installing a s around the outlet structure so that surplus can be withdrawn from lower elevations reservoir should be considered. Withdraw water with low or zero dissolved oxygen c trations would cause movement of wate higher dissolved oxygen concentrations t the bottom. If dissolved oxygen levels c maintained in deeper water, iron and man would be prevented from returning to so Dissolved oxygen concentrations downs from the discharge point should be stud determine if artificial reaeration is needed sure sufficient dissolved oxygen for aqua and to satisfy water quality require (Buchanan-Davidson--Wisconsin)
W76-12943

A PROCEDURE FOR ESTIMATING C PRODUCTION, NET PRODUCTION, ALGAL CARBON CONTENT USING 14C,
S. Buckingham, C. J. Walters, and P. Kleibe
Verhandlungen Internationale Vereinigung nologie, Vol. 19, Part I, p 32-38, 1975. 3 fig, ref.

Descriptors: *Equations, *Primary produc *Estimating, *Carbon, Carbon radioiso Kinetics, Respiration, Biomass, *Produc Model studies.
Identifiers: *Carbon 14.

CHRISTIAN U. OF L. URBANA CHAMPAIGN

odel of C-14 activity in algal cells during
d incubations was developed using basic
ic theory and taking dose rate and recycling
espiration into account. The model suggests
hort experiments may estimate gross produc-
ate, but long incubation times should not esti-
net production rate. An alternative estima-
procedure, involving several measurements of
of net uptake and using an estimate of algal
n content, is proposed to estimate both gross
et production rates. If net production is low,
rocedure can also be used to estimate algal
ass. The method depends on relatively high
ration to biomass ratios. When the method
ested in the laboratory using algal cultures
constant light and temperature, a clear ex-
ntial trend was observed as predicted by the
l and there was no change in rate of approach
uilibrium with increased dose rate. Biomass
ates compared favorably with direct esti-
from cell counts. The method appeared to
but field tests are necessary. Diurnal varia-
in the transport rate constants may make a
complex model necessary, but the same
kinetic principles will still apply. (Buchanan-
son--Wisconsin)
2944

ECOLOGICAL ASPECTS OF THE
RA BASSA DAM,
s Univ., Grahamstown (South Africa). Inst
eshwater Studies.
imary bibliographic entry see Field 6G.
2945

NUTRIENT COMPOSITION, DYNAMICS,
ECOLOGICAL SIGNIFICANCE OF DRIFT
RIAL IN THE RED CEDAR RIVER,
an State Univ., East Lansing. Dept. of
es and Wildlife.
Kevern, and R. C. Ball.
ble from the National Technical Informa-
rvice, Sprinfield, VA 22161 as PB-242 114,
paper copy, $3.00 in microfiche. Institute
er Research, East Lansing, Technical Re-
o. 6, Red Cedar River Series (MSU-IWR-
0006), December 1969. 68 p. 14 fig., 15 tab.,

tors: *Nutrients, *Streams, *Energy
*Aquatic drift, *Measurement,
gan, Seston, Chemical properties, Bed
rganic matter, Streamflow, Phosphorus,
n, Tripton, Biological properties, Sam-
iatoms, Ecology.
ers: *Red Cedar River(Mich). *Drift
(Streams).

aterial in the Red Cedar River, Michigan,
alitatively and quantitatively evaluated.
eights were highest during warm-water
upstream with greater concentrations
eam in winter. Drift increased with in-
depth; bed load samples had the greatest
rations. Drift organic matter decreased
the bottom. Increase in stream discharge
greatest single factor causing increase in
icentration. Peak amounts of drift weight
sphorus were found during the rise of
vel rather than during peak flow rates.
e and runoff effects were less
ced in early spring when the ground was
Drift concentrations were low in winter.
organic matter was high. Phosphorus con-
n was largely a function of drift weight.
nitrogen was greater than phosphorus.
ual phosphorus flow was about 12.6 met-
ith drift material contributing 2.5%. Most
5 metric tons of annual drift movement
of tripton. Drift of bottom fauna con-
416 kg to the stream's food web. There
-3549 diatoms/ml which amounted to an
movement of 634 metric tons. Drift
was only a small amount of the annual
t of total solids and much less than dis-
components. (Buchanan-Davidson--
n).

W76-12946

AN ESTIMATION OF TOTAL PRODUCTION OF PLANKTONIC COPEPODS IN NERITIC ZONE OF THE GOLFE DULION (BANYULS-SUR-MER): I. QUANTITATIVE ANNUAL VARIATION, (IN FRENCH),
Arago Lab., Banyuls-sur-Mer (France).
C. Razouls.
Vie Milieu Ser B Oceanogr. 24(2), p 257-280, 1974.

Descriptors: *Copepods, *Plankton, Aquatic animals, *Reproduction, Neritic, Variability, Productivity, Sampling.
Identifiers: Banyuls-Sur-Mer, France, Hensen nets, *Neritic zone.

The cycles of numerical variation of planktonic copepods sampled with 2 Hensen nets of different mesh size (0.330 and 0.160 mm) are very similar although the feeding capacity of one is much higher than that of the other. Total numbers follow a cycle characterized by the alternation of distinct minima and maxima which result from the successions of generations of dominating species. Periods of abundance correspond to the following months: Jan.-Feb., March-April, May-June, Sept.-Oct. The minima occur in Aug. and Dec. The amplitude of the mean quantitative annual variation varies from 18.500 (or 930/m3) to 142,400 (or 7120/m3) copepods/haul (i.e., 0.41 m2 surface) in the neritic province.--Copyright 1976, Biological Abstracts, Inc.
W76-12954

STUDIES ON A PURIFIED DIET OF PRAWN: IV. EVALUATION OF PROTEIN, FREE AMINO ACIDS AND THEIR MIXTURE AS NITROGEN SOURCE, (IN JAPANESE),
Kagoshima Prefecture Fisheries Experimental Station (Japan).
Deshimaru, Kuroki, Katsunobu, and Osamu.
Bull Jpn Soc Sci Fish. 41(1), p 101-104, 1975.

Descriptors: *Amino acids, *Nitrogen, *Proteins, Fish diets, Growth rates, Mortality, Water pollution effects.
Identifiers: Penaeus-Japonicus, *Prawns.

Prawns, Penaeus japonicus, were kept on purified test diets, which contained caseinalbumin (10:1), amino acids and their mixture as a N source for 4 wk. The level of the N source was 50, 37.5 and 25% for the protein and amino acid test diet, and 50% for diets containing a mixture of protein and amino acids. The best growth was obtained with the diet containing protein at a 50% level, followed by diets containing protein at 37.5% and 25% levels. The diets containing only amino acids brought about a very poor growth, low feed intake and high mortality, regardless of their levels in diets. Increase in the rate of protein to amino acids in the N source improved growth and feed intake and lowered mortality, suggesting that free amino acids are far inferior to proteinas N source for prawn. (See also W72-11242 and W72-11241) -- Copyright 1975, Biological Abstracts, Inc.
W76-12992

NORTH CAROLINA MARINE ALGAE. VI. SOME CERAMIALES (RHODOPHYTA), INCLUDING A NEW SPECIES OF DIPTEROSIPHONIA,
Duke Univ., Durham, N.C. Dept. of Botany.
C. W. Schneider.
Journal of Phycology, Vol 11, No 4, p 391-396, 1975. 7 fig, 19 ref. NSF GB-17545, CB-27725, CG-00005.

Descriptors: *North Carolina, *Marine algae, *Rhodophyta, Temperate, Speciation, Distribution, Systematics, *Diptera, Bays.
Identifiers: *Ceramiales, Delesseriaceae, Dasyaceae, Rhodomelaceae, Acrosorium uncinatum, Mesothamnion boergeseni, Rhododictyon bermudensis, Dasya ocellata, Dasyopsis spinuligera, *Dipterosiphonia reversa, *Onslow Bay(NC).

Previous studies of the offshore benthic algae in Onslow Bay, North Carolina, recorded as new fifteen taxa of Ceramiales, including three new species. An additional six Ceramiales have now been found in this area for the first time: Delesseriaceae--Acrosorium uncinatum; Ceramiaceae--Mesothamnion boergeseni and Rhodocictyon bermudensis; Dasyaceae--Dasya ocellata and Dasyopsis spinuligera; and Rhodomelaceae--Dipterosiphonia reversa. Acrosorium uncinatum and Rhododictyon bermudensis were also reported from South Carolina for the first time. In addition to the endemic Dipterosiphonia reversa, the other species have been known previously in tropical or subtropical waters. Acrosorium uncinatum and Dasya ocellata have frequently been reported in warm seas, but their range also extends into cool temperate waters. Previously Mesothamnion boergeseni was only known in Brazil. Dipterosiphonia reversa is added to algal literature for the first time. Evidence is also given for reassignment of Rhododictyon bermudensis from Dasyaceae to Ceramiaceae. Descriptions are presented for each, along with its known distribution, and locations of the places where it has been collected. (See also W75-10087 and W74-03885) (Buchanan-Davidson--Wisconsin)
W76-13025

ENERGY DEVELOPMENT: THE ENVIRONMENTAL TRADEOFFS. VOLUME 3: RELATIVE ENVIRONMENTAL RANKING OF PROPOSED OFFSHORE CONTINENTAL SHELF AREAS ON THE BASIS OF IMPACTS OF OIL SPILLS,
Stanford Research Inst., Menlo Park, Calif.
For primary bibliographic entry see Field 6G.
W76-13039

PUBLIC EVALUATION OF WATER QUALITY AND ITS IMPACT ON RECREATION: A CASE FROM IOWA,
Waterloo Univ., (Ontario). Dept. of Geography.
For primary bibliographic entry see Field 5G.
W76-13050

THERMAL LOADING OF HYCO LAKE, NORTH CAROLINA-- THE EFFECT OF HEATED WATER ON TEMPERATURE AND EVAPORATION, 1966-74,
Geological Survey, Raleigh, N. C.
G. L. Giese.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-254 989, $4.50 in paper copy, $3.00 in microfiche. Water-Resources Investigations 76-48, May 1976. 46 p, 15 fig, 12 tab, 7 ref.

Descriptors: *Reservoir evaporation, *Thermal powerplants, *Water loss, *Water temperature, Thermal stress, Data collections, Hydrologic budget, Mass transfer, Correlation analysis, *North Carolina, *Thermal pollution.
Identifiers: *Hyco Lake(NC).

Between May 1966 and December 1974, four phases of thermal loading from three steam-electric generators have resulted in higher temperatures and increased evaporation from Hyco Lake, a 4,350 acre reservoir in north-central North Carolina. Average thermal loads during phases 1-4 were, respectively, 1.1, 2.6, 2.9, and 3.9 trillion British thermal units per month. Average monthly surface temperature increases during phases 1-4 were 2.4, 5.1, 5.0, and 5.8 degrees Fahrenheit, while average monthly forced evaporation was 2.9, 8.0, 8.4, and 9.9 cubic feet per second, respectively. These values compare with an average annual natural lake surface temperature of 62.5 degrees Fahrenheit and average annual natural evaporation of 37 inches or 18.4 cubic feet per second (Woodard-USGS)

W76-13078

A PRELIMINARY ASSESSMENT OF THE ENVIRONMENTAL VULNERABILITY OF MACHIAS BAY, MAINE TO OIL SUPERTANKERS,
Massachusetts Inst. of Tech., Cambridge.
For primary bibliographic entry see Field 6G.
W76-13087

THE POTENTIAL EFFECTS OF INCREASING OIL TANKER SIZE ON NARRAGANSETT BAY. AN ADVISORY REPORT TO THE COASTAL RESOURCES MANAGEMENT COUNCIL.
Rhode Island Statewide Planning Program, Providence.
For primary bibliographic entry see Field 6G.
W76-13088

POSSIBLE EFFECTS OF CONSTRUCTION AND OPERATION OF A SUPERTANKER TERMINAL ON THE MARINE ENVIRONMENT IN THE NEW YORK BIGHT,
State Univ. of New York at Stony Brook. Marine Sciences Research Center.
For primary bibliographic entry see Field 6G.
W76-13089

ONSHORE IMPACTS OF OIL AND GAS DEVELOPMENT IN ALASKA, VOLUME I.
Resource Planning Associates, Inc., Cambridge, Mass.
For primary bibliographic entry see Field 5G.
W76-13090

ONSHORE IMPACTS OF OIL AND GAS DEVELOPMENT IN ALASKA. VOLUME II. METHODOLOGY APPENDICES.
Resource Planning Associates, Cambridge, Mass.
For primary bibliographic entry see Field 5G.
W76-13091

CHANGES IN THE REACTIVITY OF THE PHOTOSYNTHETIC APPARATUS IN HETEROTROPHIC AGEING CULTURES OF SCENEDESMUS OBLIQUUS. I. CHANGES IN THE PHOTOCHEMICAL ACTIVITIES,
Marburg Univ. (West Germany). Botanisches Institut.
G. Kulandaivelu, and H. Senger.
Physiologia Plantarum, Vol. 36, No. 2, p 157-164, 1976. 10 fig, 1 tab, 21 ref.

Descriptors: *Inhibition, *Photosynthesis, *Aging(Biological), *Algae, *Plant physiology, *Scenedesmus, Cultures, Biochemistry, Kinetics, Fluorescence, Pollutant identification.
Identifiers: *Photochemical activity.

Changes in photosynthetic electron transport reactions in heterotrophic cells aging under the nutrient deficient conditions were studied. When the eucaryotic, unicellular green alga, Scenedesmus obliquus, was grown heterotrophically for 10 and 30 days without the addition of fresh media, there was an 85% and 98% loss in photosynthetic capacity, respectively, and an increase in quantum requirement. No changes in pigment amounts and types could be found that would explain the decay in photosynthetic capacity. Partial reactions mediated by photosystems I and II showed a more or less constant decay period over a 30-day period. Photosystem II reactions were less stable (decaying by 95%) than photosystem I reactions (decaying by 70%) over the 30-day period. Comparative studies of the potential of aged cells for cytochrome f photooxidation, fluorescence kinetics, 520 nm absorbance changes and the variable influence of 3-(3,4-dichlorophenyl)-1,1-dimethylurea and 2,5-dibromo-3-methyl-6-isopropyl-p-benzoquinone on the photosynthetic capacity of aged cells suggested that cells have the inherent ability to photooxidize plastohydroquinone (which is primarily affected). Secondary changes were also observed in the activity of reactions on the water-splitting side of photosystem II and in the P700-plasto-cyanin-cytochrome f complex. (See also W76-13110 and W76-13111) (Buchanan-Davidson--Wisconsin)
W76-13109

CHANGES IN THE REACTIVITY OF THE PHOTOSYNTHETIC APPARATUS IN HETEROTOPHIC AGEING CULTURES OF SCENEDESMUS OBLIQUUS. II. CHANGES IN ULTRASTRUCTURE AND PIGMENT COMPOSITION,
Marburg Univ. (West Germany). Botanisches Institut.
G. Kulandaivelu, and H. Senger.
Physiologia Plantarum, Vol. 36, No. 2, p 165-168, 1976. 5 fig, 18 ref.

Descriptors: *Plant physiology, *Aging(Biological), *Cytological studies, *Photosynthesis, Cultures, *Scenedesmus, *Pigments, Chlorophyll, Respiration, Pollutant identification, Electro microscopy.
Identifiers: Chloroplasts, Thylakoid membranes.

Ultrastructural changes in chloroplasts which accompany loss of photosynthetic activity during ageing of heterotrophic Scenedesmus cells were studied by electron microscopy. Chloroplasts of actively dividing cells contained many starch grains surrounded by condensed thylakoid membrane layers. Starch grains gradually disappeared and more definite chloroplast structures formed. Later the cytoplasm became less structured and more granular; large vacuoles engulfed many organelles; and chloroplasts became more prominent. Photodensitometric analysis showed that thylakoids were very thin in dividing cells; stacking of membranes was observed during initial aging; and thickness had increased 30% by 30 days. Total chlorophyll increased on the basis of culture volume and somewhat on the basis of cell numbers for 5 days, then remained constant. Initially the chlorophyll a/b ratio decreased rapidly. Most mitochondria degenerated and were engulfed by vacuoles. Endogenous respiration decreased slowly during aging. Prolonged growth under heterotrophic conditions caused rapid loss of photosynthetic capacity but no observable disintegration of membrane structures. Results indicated the presence of an intact pigment system, even in aged cells, and that the loss of photosynthetic capacity is largely due to partial inactivation of the reoxidation capacity of the plastoquinone, the cytochrome f-plastocyanin-P700 complex, and the water oxidizing enzymatic reaction. (See also W76-13109 and W76-13111) (Buchanan-Davidson--Wisconsin)
W76-13110

CHANGES IN THE REACTIVITY OF THE PHOTOSYNTHETIC APPARATUS IN HETEROTROPHIC AGEING CULTURES OF SCENEDESMUS OBLIQUUS. III. RECOVERY OF THE PHOTOSYNTHETIC CAPACITY IN AGED CELLS,
Marburg Univ. (West Germany). Botanisches Institut.
G. Kulandaivelu, and H. Senger.
Physiologia Plantarum, Vol. 36, No. 2, p. 169-173, 1976. 7 fig., 11 ref.

Descriptors: *Algae, *Photosynthesis, *Plant physiology, *Scenedesmus, Cultures, *Aging(Biological), Light intensity, Magnesium, Manganese, Chlorophyll, Kinetics, Pollutant identification.
Identifiers: Photooxidation, Electron transport.

When dark grown Scenedesmus obliquus cultures aged 2 to 30 days were transferred into light for two hours, photosynthetic capacity reactivated 1.5 to 80 fold. During reactivation, cell numbers in packed cell volume did not increase. The react tion rate was faster when magnesium and m ganese ions were added, but addition of only f medium to aged cultures in the dark had little fect on photosynthetic rate. Cell growth and division were not observed during reactiva Light-dependent reactivation showed biph (initial rapid and second slow) increases in 2 t day-old cultures. The initial phase might be du rapid reactivation by magnesium and manga ions and the second phase to activation of pre synthetic mechanism. The action spectrum o reactivation process had the same absorp spectrum as chlorophyll in vivo, indicating reaction's energy dependence on photosynth Kinetics of cytochrome f photooxidation, 52 absorbance changes, and fluorescence indu showed that immediate recovery photosynthetic capacity was largely du reestablishment of a balanced electron tran system. Light periods of 30 to 60 minutes enough to reestablish efficient coupling bet the two photosystems. No increase in cytochrome f pool level (measured by lig duced absorption change) was observed durin reactivation period. (See also W76-13109 and 13110) (Buchanan-Davidson--Wisconsin)
W76-13111

INPUTS OF PHOSPHORUS FROM PRECIP TION TO LAKE MICHIGAN,
DePaul Univ., Chicago, Ill.
For primary bibliographic entry see Field 5B.
W76-13112

EFFECTS OF CHLORINE AND SUL REDUCTION ON LAKE MICHIGAN IN TEBRATES,
Wisconsin Univ., Milwaukee. Center for Lakes Studies.
A. M. Beeton, P. K. Kovacic, and A. S. Brool Report EPA 600-3-76-036, April 1976. 130 fig., 5 tab., 87 ref., 3 append. R-801035-01.

Descriptors: *Water pollution treat *Chlorine, *Lake Michigan, *Benthos, *Tox *Reduction(Chemical), Sewage treat Wisconsin, *Invertebrates, Effluents, Ro Copepods, Chlorination, Lethal limit, Water tion effects.
Identifiers: *Sodium sulfite, Keratella cochl Cyclops bicuspidatus thomasi.

Effects of chlorinated effluents from the Island Sewage Treatment Plant on invertebra the Milwaukee Harbor and adjacent Michigan were studied. Benthic organisms pe tions were reduced by the effluent plume. surable chlorine residuals were confined to small area around the effluent. The rotifer Ke la cochlearis and copepod Cyclops bicusp thomasi were very sensitive to chlorine resi Sodium sulfite is an efficient inexpensive ch for reducing chlorine residuals. It is not to Cyclops or Keratella at levels which r chlorine residuals in sewage, and reduces re chlorine toxicity effectively without produci desirable by-products. Complete reductio curres in less than 20 seconds. Chlorine ap tion rates to sewage should be regulated in of chlorine demand of the sewage and rec waters to minimize chlorine residuals in t fluent plume. To protect sensitive species residual chlorine levels should not exceed mg/l when applied continously. Chlorine res should be reduced by sodium sulfite when re cannot be maintained within acceptable limi where a continuously chlorinated effluent adversely affect aquatic organisms. Studies be made to determine if other chlorinated pr are present which may not be detectal residual chlorine yet are toxic. (Buchanan-l son--Wisconsin)
W76-13113

LIBRARY OF THE UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN

SIOLOGICAL CHANGES DURING THE RSE OF BLOOMS OF APHANIZOMENON S-AQUAE,
eries and Marine Service, Winnipeg itoba). Freshwater Inst.
Healey, and L. L. Hendzel.
al of the Fisheries Research Board of da, Vol. 33, No. 1, p. 36-41, 1976 3 fig., 2 tab., .

riptors: *Plant physiology, *Nuisance algae, tality, Plant populations, Growth rates, ratory tests, On-site tests, Metabolism, ogical studies, Lakes, *Canada, Nutrients, ic level, Nitrogen, Phosphorus, Nutrient rements, Deficient elements.
fiers: *Aphenizomenon flos-aquae, son-Elphinstone Area(Manitoba).

termine how physiological characteristics of populations change during blooms and how growth compared to laboratory cultures, izomenon flos-aquae cellular composition netabolism were measured during four s in three prairie lakes in the Erickson-El-one area, Manitoba, Canada. Change in cel-omposition and metabolism were larger than er nutrients so were more sensitive indica- bloom progress. Initially there was a period ponential growth corresponding to the t protein:carbohydrate ratio; high ribonucle-d, chlorophyll, nitrogen, and phosphorus ts; and lowest nitrogen and phosphorus As growth continued, this position reversed in one lake. There were no significant in ambient nutrient concentrations, despite growth and large cell nutrient changes. All eters underwent large changes during s, but none is a useful indicator of impend-oom collapse. Characteristics of nutrient ncy were well-developed before each col-ut neither indicators of impending collapse tors triggering collapse were identified. All showed characteristics of phosphorus ncy and, to a lesser extent, nitrogen defi-Despite similar characteristics, three collapsed dramatically, one did not. orus deficiency was important in establish-ditions for collapse, but was not the factor ng collapse. (Buchanan-Davidson--Wiscon-

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LE EFFECT OF LOWER PHOSPHORUS NTRATIONS ON THE PHYTOPLANK-N ONONDAGA LAKE, NEW YORK,
niv. of New York at Buffalo. Dept. of

gia, Vol. 14, No. 4, p. 197-204, 1975. 4 fig., 3 ref. FWQA 11060 FAW.

ors: *Environmental effects, orus, *Succession, *Phytoplankon, *New utrophication, Nutrient removal, Lakes, Monitoring, Water pollution, yta, Chlorophyta, Diatoms, Silica, Water pollution effects.
rs: *Onondaga Lake(NY), Phosphorus

a Lake, one of the most polluted lakes in rk, receives municipal wastes from the area and industrial wastes containing al and chloride concentrations. These, ral salt springs, give the lake a high saline Lake conditions were studied in 1969 and een monitored since. Banning of us-containing detergents in 1971-1972 pproximately a 50% reduction in inor-osphorus in Onondaga Lake. Disap-of blue-green algae from summer plank-ning in 1972 appeared related to changes orus concentration. Before 1972, flagel-diatoms were common in the spring; dur-mmer, green and blue-green algae were dominant; enough nitrogen and phosphorus were present to support the observed phytoplankton growth; and silica was depleted during diatom blooms. From 1972-1974, green algae were present in large numbers throughout the summer, and blue-green algae were absent or rare. This absence of blue-green algae probably did not result from direct growth limitation by low phosphorus levels. Reduction of pollutants entering the lake is expected to change the relative importance of phytoplankton populations without a decline in overall biomass. More changes in phytoplankton are expected when tertiary treatment of wastes entering the lake begins. (Buchanan-Davidson--Wisconsin)
W76-13116

LIGHT/DARK-PHASED CELL DIVISION IN EUGLENA GRACILIS (Z) (EUGLENOPHYCEAE) IN PO4-LIMITED CONTINUOUS CULTURE,
New York State Univ at Albany. Dept. of Biological Sciences.
S. W. Chisholm, R. G. Stross, and P. A. Nobbs.
Journal of Phycology, Vol. 11, No. 4, p. 367-373, 1975. 7 fig., 35 ref. NSF GV 29347 and AG-199, 40-193-69.

Descriptors: *Euglena, *Limiting factors, Biorhythms, Phosphates, *Cytological studies, *Cultures, Growth rates, Laboratory tests, Phosphorus, Euglena, *Euglenophyta.
Identifiers: *Euglena gracilis, Chemostats, Cyclostats.

Euglena gracilis cell density patterns and growth dynamics were studied in a light/dark entrained, phosphorus-limited chemostat (called cyclostats). Cell division was restricted to dark periods regardless of the number of cells dividing in each 24 hour period. Growth rate (amplitudes of cell density oscillation) was correlated with dilution rates. Division gate width, analyzed with a phasing index, was narrowest at dilution rates where the mean generation time of the cell population was an even multiple of 24 hours. This was due to enhanced phasing of the cell division process by the biological clock of Euglena. At all submaximal growth rates, residual phosphate levels in the cyclostat were below 0.3 micromoles phosphate. Cellular phosphorus concentrations increased with dilution rates as described by a hyperbola saturating at a maximum dilution rate of 0.74 per day with 8 x 10 to the 8th power micromoles phosphorus/cell as the minimum intracellular phosphorus concentration for growth. Similarities and differences between chemostats and cyclostats are discussed. Because the light/dark cycle is a strong natural selective force, cyclostats represent an improvement over the chemostat. A major difference is that dilution rate cannot be equated to growth rate, except when averaged over 24 hours thus gaining ecological relevance. (Buchanan-Davidson--Wisconin)
W76-13117

DIATOM COMMUNITIES FROM A DELAWARE SALT MARSH,
Delaware Univ., Newark. Dept. of Biological Sciences.
M. J. Sullivan.
Journal of Phycology, Vol. 11, No. 4, p. 384-390, 1975. 5 tab., 13 ref.

Descriptors: *Soil algae, *Diatoms, *Biological communities, *Salt marshes, *Delaware, Varieties, Ecological distribution, Habitats, Dominant organisms, Vegetation.
Identifiers: *Canary Creek(Del).

The taxonomic composition of edaphic diatom communities from five representative habitats of the Canary Creek salt marsh, Lewes, Delaware, was studied. Of 104 diatom taxa, 32 were distributed throughout the marsh and 41 were endemic to only one habitat. Three habitats supported grass standa (tall Spartin alterniflora, dwarf S. alterniflora, and Distichlis spicata) which covered 90% of the marsh surface. These habitats had the highest species diversity and greatest numbers of diatom species. The grassy cover prevented exposure to hypersaline conditions for prolonged periods and influenced temperature, which affected diatom reproduction rates. Bare bank and panne habitats were devoid of macroscopic vegetation and their diatom populations were exposed to hypersaline conditions in warmer seasons. Each habitat supported its own unique, edaphic diatom community. Community differences were related to temperature and elevation differences and interactions between edaphic diatoms and filamentous algae. Species diversity and species numbers were greatest for edaphic communities associated with dwarf S. alterniflora and D. spicata habitats, lowest for panne, and intermediate for bare bank and tall S. alterniflora habitats. Similarity index comparisons of community structure described the similarities or dissimilarities of two communities more adequately than comparisons of species diversity. The communities showed a high degree of dissimilarity. (Buchanan-Davidson--Wisconsin)
W76-13118

REGULATION OF NITRATE ASSIMILATION BY AMINO ACIDS IN CHLORELLA,
Karachi Univ. (Pakistan). Dept. of Botany.
Z. Abdullah, and J. Ahmed.
Plant and Cell Physiology, Vol. 16, No. 6, p. 971-974, 1975. 6 tab., 15 ref.

Descriptors: *Plant physiology, *Nitrogen fixation, *Amino acids, *Inhibition, Chlorella, Algae, Respiration, Metabolism, Enzymes, Denitrification, Ammonia, *Absorption, *Chlorophyta.
Identifiers: *Chlorella fusca.

Control of nitrate assimilation by exogenous amino acid supplies to the medium was studied in the green alga Chlorella fusca. Methionine, proline, valine, threonine, histidine, and glutamic acid inhibited nitrate assimilation. Alanine, tryptophan, arginine, lysine, leucine, and aspartic acid did not. Inhibition of nitrate assimilation was due to inhibition or repression of nitrate reductase. Complete destruction of reductase activity by methionine, proline, and valine indicated that nitrate reductase was both repressed and inactivated. Inhibition was reversed by non-repressors. Both amino acid classes interacted but no non-repressor amino acids behaved as universal derepressors. Leucine derepressed all repressors except glutamic acid; aspartic acid derepressed all repressors but not in the presence of threonine. Amino acids which inhibit nitrate assimilation may inhibit nitrate entry into cells. Methionine, proline, valine, histidine, and glutamic acid repressed nitrate reductase in Chlorella and cultured tobacco cells; alanine, asparagine, and leucine were non-repressors in Chlorella but repressors in tobacco. Non-repressors were not all derepressors; some repressor pairs were non-repressive, but pairs of methionine, proline, and valine were always repressive. (Buchanan-Davidson--Wisconsin)
W76-13119

FIELD DETERMINATION OF THE CRITICAL NUTRIENT CONCENTRATIONS FOR CLADOPHORA IN STREAMS,
Ontario Ministry of the Environmet, Rexdale. Limnology and Toxicity Section.
S. L. Wong, and B. Clark.
Journal of the Fisheries Research Board of Canada, Vol. 33, No. 1, p. 85-92, 1976. 4 fig., 1 tab., 19 ref.

Descriptors: *On-site-tests, *Nutrient requirements, *Cladophora, *Streams, *Canada, Aquatic weeds, Phosphorus, Plant tissues, Productivity, Aquatic weed control.
Identifiers: *Phosphorus load, North Thames River(Ontario), Avon River(Ontario), Middle

Maitland River(Ontario), Bayfield River(Ontario), Nith River(Ontaro), Conestogo River(Ontario).

Because many streams in southern Ontario have excessive seasonal growths of aquatic plants such as Cladophora and Potamogeton, critical phosphorus and nitrogen concentrations for Cladophora were determined in six rivers. A direct relationship between ambient phosphorus concentrations in water and phosphorus concentrations in plant tissue with a regression coefficient of 0.87 was observed. Determination of actual phosphorus concentrations below which the specific Cladophora growth rate was reduced was hard to determine, especially under field conditions; it is approximately 1.6 mg phosphorus/g dry wt in tissue and 0.06 mg/l in water. No significant correlation was observed between the nitrogen content of plant tissue and that of water. Correlation of total phosphorus with plant growth can be used to estimate the waste load which would cause maximum growth of Cladophora. However this does not have any predictive value with respect to total biomass or dissolved oxygen fluctuations. Because plant tissue phosphorus content is less affected by daily fluctuations in ambient phosphorus concentration, it can be used to predict the average ambient nutrient concentration in a river reach over a period of time with fewer samples. (Buchanan-Davidson--Wisconsin)
W76-13120

DYNAMICS OF NUMBER AND BIOMASS OF PLANKTONIC INFUSORIA IN OPEN ZONES OF KREMENCHUG RESERVOIR AND THEIR PRODUCTION AND ROLE IN ORGANIC MATTER DESTRUCTION, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.
For primary bibliographic entry see Field 2H.
W76-13141

AN ATTEMPT TO EVALUATE THE STATE OF HEALTH OF FISH FROM THE LYNA AND WALSZA RIVERS IN CONNECTION TO THEIR POLLUTION, (IN POLISH),
H. Dabrowska.
Przegl Zool. 18(3), p 390-395, 1974.

Descriptors: Water pollution effects, *Fish diseases, Europe, *Fish parasites, *Waste disposal, Outfall sewer, Outlets, Organoleptic properties, Perches, Pikes, Rivers, Trematodes.
Identifiers: Acanthocephalus-Sp, Chondrostoma-Nasus, Chub, Gudgeon, Orfe, Perch, *Poland, Roach, Rudd, Silver bream, Trichodina, Walsza River(Poland), Lyna River(Poland).

Parasitological, anatomo-histopathological and organoleptic studies of fish caught by an electric device above and below the outlet of wastes into the Lyna and Walsza Rivers (Poland) were carried out. From the Lyna River, pike, roach, perch, silver bream, orfe, rudd and chub were examined; Chondrostoma nasus, roach, chub and gudgeon were taken from the Walsza River. Parasites (21 spp.) were found; 14 on fish from the Lyna River and 8 on fish from the Walsza River. Most numerous were eye trematodes- 91.6% (Lyna) and 56.6% (Walsza), the Trichodina 79.1% (Lyna), and Acanthocephalus sp. 54.1% (Lyna). Intensity of parasite infection was much higher in both rivers in fish caught at polluted stations. Histological examination of gills showed that 70% of fish from the Lyna had necrobiotic changes of the epithelium and disorders in the gill circulation system. In fish caught at the clean station, gills were generally in good condition.--Copyright 1975, Biological Abstracts, Inc.
W76-13192

CHARACTERISTICS OF THE PRIMARY PRODUCTION IN THE SALMON BREEDING LAKE, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Institut Biologii Vnutrennykh Vod.
Y. I. Sorokin, E. B. Pavel'eva, and M. I. Vasil'eva.
Zh Obshch Biol. 35(5), p 746-755, 1974.

Descriptors: *Primary productivity, *Lakes, *Biomass, *Algae, Eutrophication, Nutrients, Fertilization, Breeding, Water pollution effects, *Salmon.
Identifiers: Oncorhynchus-Nerka, Russian-SFSR, Lake Dalnee(USSR), Kamchatka.

During 2 seasons primary production was estimated in Lake Dalnee (Kamchatka) (Russian SFSR, USSR) the breeding place of Oncorhyncus nerka. Primary production in 1970 was 171; and in 1971, 147 gC/m2/yr. The average biomass of algae in water column was correspondingly 0.7 and 1.4 gC/m2. Primary production in the lake is still relatively high and is not seriously influenced by the decrease in nutrient income caused by the drop in the number of fish arriving for breeding, and so fertilizing it.--Copyright 1975, Biological Abstracts, Inc.
W76-13193

CONTENT OF SOME TRACE ELEMENTS IN MACROPHYTES OF THE VOLGA DELTA, (IN RUSSIAN),
Kaspiiskii Nauchno-Issledovatelskii Institut Rybnogo Khozyaistva, Astrakhan (USSR).
For primary bibliographic entry see Field 5A.
W76-13194

QUANTITATIVE DYNAMICS OF BACTERIA IN THE KREMENCHUG RESERVOIR, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.
N. I. Sakharova, and L. G. Brantsevich.
Gidrobiol Zh. 10(4), p 94-96, 1974.

Descriptors: *Bacteria, Seasonal, Reservoir, Spatial distribution, Temporal distribution, *Distribution patterns, *Algae, Microorganisms, Benthos.
Identifiers: *Azotobacter-Like organisms, *Bacilli, *Cocci, Spores, Ukrainian-SSR, Dniepr River(USSR), *Kremenchug Reservoir(USSR).

The vertical, horizontal and seasonal distribution of bacilli, cocci, spores, azoto-bacter-like and other organisms was studied in the water and bottom deposits of the Kremenchug Reservoir on the Dniepr River (Ukrainian SSR, USSR). A comparative evaluation of the distribution of algae and bacteria of different morphological groups showed that neither the abundance of algae nor their physiological state affected the relationship of the morphological groups of bacteria in the aquatic biocenoses. In all cases bacilli predominated over cocci, and among the bacilli, the nonsporulating predominated. However, there was a direct and inverse relation between the number of algae and content of microorganisms in the water and bottom deposits, which was determined not only by the abundance of algae but also by their physiological state.--Copyright 1975, Biological Abstracts, Inc.
W76-13195

ZOOPLANKTON POPULATIONS IN THE 'WATER-SPORTBAAN GEORGES NACHEZ' AT GHENT IN 1972, A YEAR OF CONTINUOUS WATERBLOOMING, (IN FLEMISH),
Ghent Rijksuniversiteit (Belgium). Faculteit Landbouwwetenschappen.
J. De Maeseneer.
Natuurwet Tijdschr. 55(4-6), p 193-201, 1973.

Descriptors: *Zooplankton, *Eutrophication, *Sampling, Europe, Algae, Aquatic plants, Crustaceans, Daphnia.
Identifiers: Asplanchna, *Belgium(Ghent), Bosmina, Brachionus-Angularis, Brachionus-Calyciflorus, Filinia-Longiseta, Keratella-Cochlearis, Keratella-Quadrata, Phormidium-Sp, Polyarthra, Pompholyx-Sulcata, Stephanodis Sp.

Zooplankton populations in samples colle weekly in the 'Nationale Water-sportbaan Geo Nachez' at Ghent (Belgium) i 1972 were quit ferent from those in 1969. The latter year characterized by the absence of waterbloo during the former, extensive bloom Stephanodiscus sp. (early Spring) and Phormi sp. (rest of the year) developed. Cladoceran p lations (Bosmina and especially Daphnia) severely reduced in 1972. Nauplii also decrea 1972. Cyclopids, however, did not seem to b versely affected. With the exceptio Brachionus angularis and Polyarthra, popul of B. calyciflorus, Keratella cochlearis quadrata, Filinia longiseta, Asplanchna Pompholyx sulcata were higher in 1972. The regular presence of Polyarthra, F. longiseta a angularis in 1972 is also obvious as well a earlier appearance of P. sulcata. It is not k whether the influence of the waterbloom direct.--Copyright 1975, Biological Abstracts W76-13196

LONG-TERM CHANGES IN THE BEN BIOMASS OF THE KUIBYSHEV W STORAGE BASIN, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Institut B Vnutrennykh Vod.
S. M. Lyakhov.
Gidrobiol Zh. 10(4), p 21-23, 1974.

Descriptors: *Biomass, *Benthos, Water st Trophic level, River basins, Sediments, Mud
Identifiers: *Kuibyshev River basin(USSR).

For a long time, benthos on the flooded land Kuibyshev water storage basin (Russian USSR) was extremely poor because of unf ble trophic conditions. Recently (since 1966) mulation of mud sediments and a rise trophic level have resulted in a 5-7-fold incre the benthos biomass in this area with simult growth in the former Volga bed. The next s sional stage in the water storage basin benth stage of biotope leveling-will be very long.-- right 1975, Biological Abstracts, Inc.
W76-13198

FEEDING OF THE BRONZE BREAM O GORKI RESERVOIR IN THE DISCH ZONE OF THE KOSTROMA STATE GIONAL ELECTRIC POWER PLANT, (I SIAN),
T. S. Zhiteneva.
Gidrobiol Zh. 10(4), p 104-107, 1974.

Descriptors: Fish, *Water temperature, M ism, Electric powerplants, *Fish food orga Growth rates, Reservoirs, *Thermal pollutio
Identifiers: *Bronze bream, *Gorki voir(USSR).

The Kostroma state regional electric powe at the mouth of the Shacha River on the reservoir (Russian SFSR, USSR) was p operation in 1969. At the water temp characteristic for the discharge zone of th the metabolism of the bronze bream is e and the food requirement is high. Howeve the quantity and quality of the food avail the bream are low, which has an adverse ef growth of the fish. In the discharge zone power plant the poor feeding conditions are destruction of the bottom and shore bio during construction.--Copyright 1975, Bi Abstracts, Inc.
W76-13199

PRODUCTION OF PONTOGAM ROBUSTOIDES GRIMM. IN THE RESE COOLER OF THE KURAKHOVIAN STA

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ONAL ELECTRIC POWER STATION, (IN SSIAN),
ademiya Nauk URSR, Kiev. Instytut robiologii.
A. Kititsina, and M. L. Pidgaiko.
robiol Zh. 10(4), p 30-37, 1974.

criptors: *Crustaceans, Electric powerplants, ermal pollution, Water temperature, Heated er, Biomass, *Reproduction.
ntifiers: *Pontogammarus-Robustoides, Tux, USSR.

production of 2 P. robustoides populations estimated in the reservoir sections (USSR) racterized by different temperature conditions. structure of the population changes in the ed section 1-2 mo. earlier than in the control. duction of P. robustoides in the heated zone hes its peak in spring; in the control, in mer. Under heated conditions the average an- biomass is reproduced 5 times in a year cycle 4 times in the control. Cladophora and ifex are the principal foods.--Copyright 1975, ogical Abstracts, Inc.
-13200

Waste Treatment Processes

D APPLICATION OF WASTEWATER, ERATURE REVIEW),
York State Dept. of Environmental Conser- n, Albany.
Tofflemire.
al Water Pollution Control Federation, Vol. o. 6, p 1180-1191, June, 1976. 138 ref.

riptors: *Water reuse, *Irrigation, *Overland *Infiltration, Groundwater recharge, omics, Injection wells, Bacteria, Percolation, s, Surface waters, Groundwater, Land use, iosis, Phosphates, Nitrogen, *Reviews, iographies.
fiers: *Land application, *Literature vs.

rature review of papers dealing with the ap- on of waste water to land via irrigation, nd flow, and infiltration is presented. ic topics covered include: the loading con- s of land treatment systems, cost curves for l types of land application systems, ch on the spray irrigation of lagoon effluent ed pine hardwood forests, systems involv- ay irrigation and recycling to lakes, the ad- es of drip or trickle irrigation over flood or nd furrow methods, shallow injection well ge with tertiary effluent, techniques for con- g sanitary surveys, phosphate removals in eed irrigated with various amounts of lary effluent, waste water nitrogen removal p irrigation systems, bacterial aerosols as- d with spray irrigation of chlorinated secon- ffluent, percolation tests for rapid infiltra- stem design, and disposal well operating ns and solutions. (Kreager-FIRL)
2676

R RECLAMATION AND REUSE, ATURE REVIEW),
pal Environmental Research Lab., Cincin- nio. Wastewater Research Div.
nglish, and T. M. Mitchell.
Water Pollution Control Federation, Vol. 6, p 1174-1180, June, 1976. 57 ref.

tors: *Water reuse, *Reclamation, med water, *Waste water treatment, ing, Irrigation, Groundwater recharge, studies, Industrial wastes, Municipal Ion exchange, Treatment facilities, Pota- r, Economics, *Reviews, *Bibliographies. rs: *Literature reviews.

A review of literature dealing with water reclamation and reuse is presented. Topics covered include: surveys of municipal waste water reuse, a simulation model for evaluating the economic efficiency of water reuse, the use of water recycle in poultry processing plants, automatic car wash water recycle systems, the use of ion exchange for the removal of color and minerals from kraft bleach plant waste, municipal irrigation systems, injection systems for using tertiary treated trickling filter effluent for groundwater recharge, a computerized model of a treatment system capable of producing potable water from secondary effluent, and modifications to existing waste water treatment systems to allow for future reuse of effluent. (Kreager-FIRL)
W76-12677

AN ASSESSMENT OF THE AIRBORNE EMISSION OF SELECTED VIRUSES BY WASTEWATER TREATMENT FACILITIES,
Michigan Univ., Ann Arbor.
For primary bibliographic entry see Field 5A.
W76-12678

INTER-RELATION OF KEY-FACTORS FOR INFILTRATION OF LIQUID DOMESTIC WASTE INTO SOIL,
Connecticut Univ., Storrs.
F. W. Kropf.
Available from University Microfilms, Inc., Ann Arbor, Mich., 48106, Order No. 76-10,274. Ph.D. Thesis, 1976, 84 p.

Descriptors: *Waste water treatment, *Infiltration, *Infiltration rates, *Waste disposal, *Effluents, Domestic wastes, Liquid wastes, Absorption, Septic tanks.
Identifiers: Land application, Septic tank effluents.

Soil disposal systems are frequently a valid alternative to aquatic disposal; their long term absorption capacity is controlled by either the hydraulic criterion or the infiltration criterion, which is the acceptance rate of the biological slime layer at the soil interface. Columns of three representative soils were flooded with septic tank effluent, either continuously, for 6 hours once a day, or for 12 half hour periods daily. Intermittent flooding was not advantageous for long term operation. The biological slime layer causing the clogging did not become completely impervious; the minimum infiltration rates were one to 2 cm/day. The effect of soil permeability on absorption rate was relatively small, provided the system was governed by the infiltration criterion. The infiltration interface orientation did not affect the infiltration rate. Continuous slime layer inundation did not adversely affect its capability to infiltrate liquid. Various design recommendations are outlined for fail-safe operation of small scale soil infiltration systems. (Snyder-FIRL)
W76-12679

SLUDGE PROCESSING, TRANSPORTATION AND DISPOSAL/RESOURCE RECOVERY: A PLANNING PERSPECTIVE,
Environmental Protection Agency, Washington, D.C. Div. of Water Planning.
J. M. Wayatt, and P. E. White, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-251 013, $7.75 in paper copy, $3.00 in microfiche. Report EPA-440/9-76-002, December 1975, 201 p, 61 tab, 21 fig, 121 ref, append. EPA No. 68-01-3104.

Descriptors: *Sewage treatment, *Alternative planning, Sludge treatment, Sludge disposal, Sanitary engineering, Cost-benefit analysis, Water pollution, Transportation, Waste disposal, *Waste treatment.

The purpose was to provide information to planning agencies regarding the sources, characteristics, treatment methods, transportation modes, and ultimate disposal processes for residual wastes generated in municipal wastewater treatment plants. Technical, economic, social, and institutional factors pertinent to the alternatives are considered. Handling and treatment processes were evaluated in light of qualitative and quantitative changes to the residual wastes. Environmental, operational and institutional constraints to the use of ocean disposal, lagoons, sanitary landfills, sludge recycling, and land reclamation were presented. (Chilton-ORNL)
W76-12683

ATLANTIC RICHFIELD HANFORD COMPANY, QUARTERLY REPORT, TECHNOLOGY DEVELOPMENT FOR LONG-TERM MANAGEMENT OF HANFORD HIGH-LEVEL WASTE, JULY 1975 THROUGH SEPTEMBER 1975.
Atlantic Richfield Hanford Co., Richland, Wash. Advanced Waste Engineering Dept.
Available from the National Technical Information Service, Springfield, VA 22161 as ARH-ST-132 A. $4.50 in paper copy, $3.00 in microfiche. Report ARH-ST-132 A, March 1976, 65 p, 9 tab, 8 fig, 5 ref. Kounts, J.S., Editor. E(45-1)-2130.

Descriptors: *Waste disposal, *Radioactive waste disposal, Engineering, Environmental engineering, Long-term planning.

A program for the development of technology for removal of waste from underground storage tanks, conversion of the waste to an improved stabilized form, and final storage of the imobilized waste in a location that does not require controlled management is reported on. A section on Storage System Integrity and Engineered Improvements establishes a data base and methodology for periodic evaluation of in-tank storage. The Immobilization and Storage section provides a summary of work associated with technology for the conversion of retrieved waste to an immobilized form satisfactory for final storage. Contaminated Equipment Volume Reduction section addresses the development and demonstration of methods for the reducing of radioactively contaminated metallic items to a size and form suitable for final storage or disposal. (Chilton-ORNL)
W76-12684

FEASIBILITY OF MICROBIAL DECOMPOSITION OF ORGANIC WASTES UNDER CONDITIONS IN DEEP WELLS,
Oklahoma State Univ., Stillwater. Dept. of Microbiology.
M. M. Grula, and E. A. Grula.
Available from the National Technical Information Service, Springfield, VA 22161 as BERC/RI-76/6, $4.50 in paper copy, $3.00 in microfiche. Report BERC/RI-76/6, March 1976, 57 p, 18 tab, 22 ref. HO 122120, Modification No. III.

Descriptors: *Waste treatment, *Biodegradation, *Microbial degradation, *Deep wells, Organic wastes, *Decomposing organic matter, Waste disposal.

The objective was to determine the feasibility of inoculation of the waste with bacteria which would decompose toxic substances underground through metabolic processes. Under aerobic conditions, temperature was not a constraint. Thermophilic bacteria decomposing a wide variety of compounds are readily obtained from ordinary soil. Mixed cultures were found to be more efficient biodegraders than pure cultures. High pressures inhibited biodegradation at high temperatures. All strains isolated grew well at 1000lb/sq. in. helium on a complex medium. Hyperbaric oxygen was toxic for all organisms tested. Attempts to derive modified strains with a higher growth temperature range than the parent strain failed. It was concluded that in situ biodegradation was not a reliable means of removing organic wastes in deep wells. (Chilton-ORNL)
W76-12688

INTERIM SOLIDIFICATION OF SRP WASTE WITH SILICA, BENTONITE, OR PHOSPHORIC ACID,
Du Pont de Nemours (E.I.) and Co., Aiken, S.C. Savannah River Lab.
G. H. Thompson.
Available from the National Technical Information Service, Springfield, VA 22161 as DP-1403, $3.50 in paper copy, $3.00 in microfiche. Report DP-1403, March 1976, 12 p, 1 fig, 2 tab, 12 ref. AT(07-2)-1.

Descriptors: *Radioactive waste disposal, *Alternative planning, Radioactive wastes, Storage, Chemistry, Separation techniques, South Carolina, Silica, Bentonite, Chemical reaction, *Waste treatment.
Identifiers: Savannah River Plant(SC), *Solidification(Nuclear wastes), Phosphoric acid.

Results of the study show that alkaline waste can be solidified by reaction with silica gel, silica flour, or sodium silicate solution. Alkaline supernate can be solidified by reaction with bentonite to form cancrinite powder. In both of these cases, the solidified wastes can be retrieved by slurrying with water. Alkaline supernate can be solidified by partial evaporation and reaction with phosphoric acid. Plant waste treated in this way would not solidify completely because of decay heat. Reaction of simulated alkaline waste solutions with all of these resulted in increased volume. The best method for in-tank solidification appeared to be by evaporation since this contributes no additional solids and did not compromise any waste management options. (Chilton-ORNL)
W76-12690

CORRELATION OF RADIOACTIVE WASTE TREATMENT COSTS AND THE ENVIRONMENTAL IMPACT OF WASTE EFFLUENTS IN THE NUCLEAR FUEL CYCLE FOR USE IN ESTABLISHING AS LOW AS PRACTICABLE GUIDES-FABRICATION OF LIGHT-WATER REACTOR FUELS CONTAINING PLUTONIUM,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 5C.
W76-12694

ACTIVATED CARBON TREATMENT OF PHENOLIC PAINT STRIPPING WASTEWATER,
Facet Enterprises Industries, Inc., Warwick, R.I.
A. E. Perrotti.
Report AFCEC-TR-75-14, August 1975. 131 p, 63 fig, 15 tab, 7 ref, 2 append. F08638-74-C-0005.

Descriptors: Engineering, *Water pollution, *Waste water treatment, Civil engineering, Chemical engineering, On-site laboratories, Industrial wastes, Phenols, Water pollution sources, Paints, *Activated carbon.

This study was conducted to ascertain the economical and technical practicality of using a granular carbon system for treating large volumes of phenol bearing wastewater from the depainting of aircraft and related equipment. Laboratory investigations characterized the waste water and evaluated different activated carbons for its treatment. A pilot plant was then set up at Kelly Air Force Base for treatment of phenol wastewater. In the pilot plant operation, carbon was exhausted five times and thermally regenerated four times. The pilot plant was operated intermittently for a period of six months. It was concluded that activated carbon was a viable treatment method for the removal of phenol and it was recommended that a full scale system be installed with a capacity of 50 gallons per minute flow. (Chilton-ORNL)
W76-12696

CHEMICAL WASTE LAND DISPOSAL FACILITY DEMONSTRATION GRANT APPLICATION.
Barr Engineering Co., Minneapolis, Minn.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-249 747, $7.50 in paper copy, $3.00 in microfiche. EPA/530/SW-87d.i, 1976, 178 p. S 803744.

Descriptors: *Waste disposal, *Industrial wastes, *Chemical wastes, Landfills, Liquid wastes, Solid wastes, Sludge disposal, Government finance, Grants, *Minnesota.

This document is an application for a grant from EPA to Minnesota Pollution Control Agency to demonstrate land disposal techniques for potentially hazardous chemical wastes. It presents the demonstration approach to be used and identifies and discusses work tasks, potential facility designs, personnel needs, budget needs, contractor/consultant arrangements, implementation procedures, evaluating and reporting procedures, and the existing regulatory framework. (Chilton-ORNL)
W76-12699

OPERATIONS MANUAL ANAEROBIC SLUDGE DIGESTION,
Stevens, Thompson and Runyan, Inc., Portland, Oreg.
C. Zickefoose, and R. B. J. Hayes.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-250 129, $7.50 in paper copy, $3.00 in microfiche. Report EPA 430/9-76-001, February 1976. 174 p, 34 fig, 16 tab. EPA No. 68-01-1706.

Descriptors: *Waste disposal, *Waste water treatment, *Anaerobic digestion, Sludge disposal, Publications.
Identifiers: *Operations manual(Treatment).

The manual covers the areas of troubleshooting, general operation, safety, start-up of units, basic theory, sampling and laboratory testing, and day-to-day operation of anaerobic digestors in municipal wastewater treatment plants. It is intended for use by plant operators and its format allows for easy use of portions of most interest. (Chilton-ORNL)
W76-12700

MEADOW/MARSH SYSTEMS AS SEWAGE TREATMENT PLANTS,
Brookhaven National Lab., Upton, N. Y.
M. M. Small.
Report BNL 20757, November 1975, 37 p, 6 fig, 2 tab, 22 ref.

Descriptors: *Sewage treatment, *Waste water treatment, *Cost analysis, Ponds, Marshes, Grasslands, *Treatment facilities, New York, Groundwater, Water reuse.
Identifiers: *Long Island(NY).

The two sewage treatment systems reported upon are both closed, natural systems which produce no objectionable odors, no excess of flies or mosquitoes and release a minimum of airborne mists. Each system processes 10,000 gallons of domestic sewage per day and returns drinkable water to Long Island's ground water supply. Neither produces any sludge for further disposal. The two systems are called Meadow/Marsh/Pond (M/M/P) and the Marsh/Pond(M/P) systems. On the basis of investigations to date both systems can be recommended for use as sewage treatment plants, water producers and farms for sewage loads between 10,000 and 1,000,000 gallons per day. The M/P requires one half as much land and so has a lower first cost but it does not offer an upland crop for harvest and resale as does the M/M/P and for that reason may not be less expensive to operate. (Chilton-ORNL)
W76-12753

ACID DIGESTION OF COMBUSTIBL WASTES: A STATUS REPORT,
Hanford Engineering Development Lab Richland, Wash.
R. E. Lerch.
Report HEDL-TME 75-5, May 1975. 90 p, 15 fi 29 tab, 27 ref.

Descriptors: *Nuclear wastes, *Waste treatme Engineering feasibility, Chemical reaction *Degradation(Decomposition)
Identifiers: *Acid digestion.

Tests using a 200 liter Acid Digestion Test Unit i dicated the engineering feasibility of the proce and showed acid digestion to be a potentially a tractive method for treating combustible nucle wastes. Hot concentrated sulfuric acid deco posed all common combustible waste materi when nitric acid was added as an oxidant. Deco position produced an inorganic residue of sulfat and oxides having a volume of about 2-4% of t initial waste. Plutonium was largely converted t nonrefractory form which is readily leached fr the residue with nitric acid. Sulfuric acid is reu ble. Nitrogen and sulfur oxides can be oxidized provide a recyclable acid. (Chilton-ORNL)
W76-12776

THE IMPACT OF INCREASED FUEL COS AND INFLATION ON THE COST OF DESAL ING SEA WATER AND BRACKISH WATERS,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 3A.
W76-12778

TRITIUM EFFLUENT CONTROL PROJEC PROGRESS REPORT: JULY - SEPTEMB 1975,
Mound Lab., Miamisburg, Ohio.
C. J. Kershner, and J. C. Bixel.
Report MLM - 2288, March 1976, 30 p, 14 fig tab, 36 ref. E-33-1-GEN-53.

Descriptors: Reviews, *Control syste *Tritium, Effluents, Liquid wastes, Sp trophotometry, *Waste treatment, *Pollut identification, Separation techniques.

Basic separation and enrichment technology be developed and applied to gaseous and liquid fluent detritiation and recovery is reported. major portion of the gaseous effluent treatme presently in the pilot scale phase. Work on tritia liquid waste decontamination (molecular exc tion) continues. In preparation for experiments the IR spectrum of HTO, a spectrophotometer has been modified for use with HTO and a loading system was assembled and tested. W on electrolysis of high level tritiated water catalytic exchange detritiation studies is repor A tritiated water shipping container has b designed and developed for use with the ER DOT approved Al-MI secondary contai (Chilton-ORNL)
W76-12779

TRITIUM EFFLUENT CONTROL PROJE PROGRESS REPORT: JANUARY - MAR 1975,
Mound Lab., Miamisburg, Ohio.
C. J. Kershner, and J. C. Bixel.
Report MLM - 2235, August 1975, 28 p, 4 ta fig, 23 ref. E-33-1-GEN-53.

Descriptors: Reviews, *Control syste *Tritium, Effluents, Wastes, Spectrophotome *Waste treatment, *Pollutant identification.

Progress on the tritium emission control projec itiated at Mound Laboratory in 1972 is repor Tritium is confined at the source through us glove box atmosphere detritiation and in this gard a 100 cfm, pilot scale, helium purification was installed. HIP alloy-hydrogen isotherm

ere obtained at 28, 200, 400, and 600 degrees C. catalytic exchange detritiation studies, approval awings were received for a bench scale test stem for evaluation of a hydrophobic catalyst r hydrogen/water exchange. In order to more early define the frequency and power of ir radiaon required for the molecular excitation, study of e HDO ir spectrum was undertaken. This work ll be expanded to HTO. In the tritiated liquid ste decontamination by molecular excitation ogram the isotope effects on the key reactions re calculated, the rate of the exchange reaction s analyzed, and the effect of the tritium beta cay on the water/hydrogen system was calcued in a qualitative manner. (Chilton-ORNL)
6-12780

ITIUM EFFLUENT CONTROL PROJECT, OGRESS REPORT: OCTOBER - DECEMBER 4,
und Lab., Miamisburg, Ohio.
primary bibliographic entry see Field 5G.
6-12781

ITIUM EFFLUENT CONTROL PROJECT, OGRESS REPORT: APRIL - JUNE 1975,
und Lab., Miamisburg, Ohio.
primary bibliographic entry see Field 5G.
6-12782

GAR PLANT WASTE WATER UTILIZED R IRRIGATION,
. Dodolina, and V. M. Novikov.
ilable from the National Technical Informa- Service, Springfield, VA 22161, as AD-A017 $7.50 in paper copy, $3.00 in microfiche. Draft nslation 500, November 1975, 9 p, 5 tab, 7 ref. nslated from Sakharnaya Promyshlennost, No. 75.

criptors: Agriculture, *Waste water treatment, gation, *Sugar crops, Sewage disposal, Waste osal, Water reuse.

as been established that waste waters from r plants have a relatively high fertilization e when used in irrigation of agricultural crops. e waste waters make it possible to use less ful, marginal and other kinds of land for ultural purposes. It was concluded that it d be expedient to alternate irrigations with fil- and unfiltered waste water and that, to this each sugar plant should create irrigation which will make it possible to rationally pund utilize waste from sugar plants. (Chilton-L)
12846

BULENT BED COOLING TOWER,
ue Univ., Lafayette, Ind.
Barile.
rt EPA-660/2-75-027, June 1975, 32 p, 2 tab, 3 ref. 801867.

iptors: *Engineering structures, *Cooling s, Cost analysis, Turbulence, Waste treat- Treatment facilities.
fiers: *Turbulent bed cooling towers.

nary concern in assessing the turbulent bed g tower was to compare it with acceptable already in use. The turbulent bed uses light, plastic spheres as a packing which fluidize lows upward through the bed, while water is d downward over the bed. It was found that rbulent bed cooling tower performed mar- as compared with conventional mechanical cooling towers. The turbulent bed cooling required almost twice the auxilliary power it cooling load but the capital investment be less because of its smaller size. (Chilton-)
2847

FUNDAMENTAL STUDY ON THE POST TREATMENT OF RO PERMEATES FROM ARMY WASTEWATERS,
Illinois Univ. at Urbana-Champaign. Dept. of Environmental Engineering.
E. S. K. Chian, and P. P. K. Kuo.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-021 476, $6.00 in paper copy, $3.00 in microfiche. Technical Report UILU-ENG-75-2026, October, 1975. 131 p, 44 fig, 19 tab, 74 ref, 2 append.

Descriptors: *Waste water treatment, *Pollutant identification, *Biological treatment, *Analytical techniques, *Tertiary treatment, Organic matter, Waste water(Pollution), Ozone, *Reverse osmosis.

The removal of organic matter in MUST hospital waste water after the reverse osmosis (RO) process by treating with ozone, activated carbon, and ion-exchange resins was studied. Biological pretreatment of MUST waste water followed by ultrafiltration (UF), RO and ozone processes were also studied for the removal of gross organic matter. Pretreatment of RO permeates by activated carbon enhanced organic removal by ozonation while ion-exchange pre-treatment hindered its removal. Organic removal by both activated carbon and ion-exchange pre-treatment was enhanced when the RO permeates were pretreated with ozone. The advantage of biological pre-treatment for reducing the power requirement for the later ozonation step was not obvious. The mechanism of organic removal by ozonation followed pseudo first order reaction kinetics during the early stage. Pseudo first order kinetics were also found in the second stage of ozonation, but at a greatly reduced rate. Stripping and distillation techniques and direct GC analysis were developed to analyze volatile organic compounds present in RO permeates. Solvent extraction coupled with high pressure liquid chromatography (HPLC) technique was developed to analyze nonvolatiles. Methanol and acetone were present in most of the RO permeates of MUST hospital wastes and o-toluidine and NN-diethyl-m-toluamide were present in the RO permeate of composite waste. (Snyder-FIRL)
W76-12851

AMMONIA REMOVAL FROM WASTEWATERS: A REVIEW OF THE STATE OF THE ART,
Army Dugway Proving Ground, Utah.
J. H. Whiting, and A. P. Adams.
Available from the National Technical Information Service, Springfield, VA 22161, as AD-A020 698, $4.00 in paper copy, $3.00 in microfiche. Technical Report 4904, Picatinny Arsenal, Dover, N. J., January, 1976. 57 p, 9 fig, 2 tab, 15 ref, 2 append.

Descriptors: *Waste water treatment, *Ion exchange, *Reverse osmosis, *Ammonia, *Nitrification, *Denitrification, Waste water(Pollution), Industrial wastes, Evaluation, Nitrates.
Identifiers: *Ammonia removal, Nitrification-denitrification, *Air stripping, Breakpoint chlorination.

Processes to remove ammonia from munitions plant waste streams were reviewed and evaluated. Various explosive wastes and high levels of ammonia and nitrates are present in these waste waters. Abatement regulations require removal of both the ammonia and nitrates. Several processes, such as air stripping, ion exchange, and breakpoint chlorination, are effective in the removal of ammonia from waste waters, but they do not reduce the nitrate concentration. Other processes must be used to remove the nitrates, imposing additional costs. Biological nitrification-denitrification effectively reduces both ammonia and nitrate concentrations in the waste water. Ammonia is biologically oxidized to nitrite, then to nitrate which, in turn, is reduced to nitrogen gas by the biological denitrification process. It is clean, efficient, and cost-effective. Reverse osmosis was also studied. (Snyder-FIRL)
W76-12853

A TECHNICAL, ENVIRONMENTAL AND ECONOMIC EVALUATION OF THE 'WET PROCESSING SYSTEM FOR THE RECOVERY AND DISPOSAL OF MUNICIPAL SOLID WASTE'.
Systems Technology Corp., Dayton, Ohio.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-245 674, $7.75 in paper copy, $3.00 in microfiche. Report EPA-530-SW-109c, 1975. 217 p, 34 fig, 20 tab, 9 append.

Descriptors: *Waste water treatment, *Biochemical oxygen demand, *Treatment facilities, *Recycling, *Solid wastes, Municipal wastes, Economics, Grants, Waste disposal, Evaluation.
Identifiers: Municipal solid waste, Demonstration grants, *Wet processing system.

Results are presented of a technical, economic, and environmental evaluation of the wet processing concept for the disposal of solid waste. The facility studied was the Franklin Solid Waste and Fiber Recovery Plant, in Franklin, Ohio. The facility consists of three major systems; Hydrasposal (containing the pulping, separation, dewatering and incineration subsystems); fiber recovery; and glass recovery. When fiber recovery is not used, the facility requires additional water for pulping, but does not discharge water that would require treatment by a waste water treatment plant. With fiber recovery operational, the plant sends 2500 gallons of whitewater/ton of input refuse for treatment to the adjacent waste water treatment plant. Of the 3060 gallons of water/ton of input refuse required, 2300 gallons/ton comes from the final clarified water of the waste water treatment plant. Pulping and separation (P&S) involves dividing the solid waste into light and heavy streams. Waste water treatment sludge is introduced into the stream prior to the cone press dewatering step, the second of two steps in the dewatering process. The fiber recovery system receives the light fraction from the P&S subsystem and recovers a portion of the usable fiber contained in it. The impact on water quality as assessed by evaluating the influent and effluent flows. The output from the venturi scrubber does not require biological treatment, only solids removal. Eighty-one percent of the suspended solids loading and 73% of the biochemical oxygen demand (BOD) loading of the effluents leaving the plant are contributed by the effluent from fiber recovery. Economic data were developed for all major subsystems within the plant. (Snyder-FIRL)
W76-12854

REST AREA WASTEWATER TREATMENT AND DISPOSAL,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
J. T. Pfeffer.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-246 061, $4.50 in paper copy, $3.00 in microfiche. Report UILU-74-2030, November, 1974. 48 p, 4 fig, 12 tab, 15 ref. IHR-701.

Descriptors: *Waste water treatment, *Treatment facilities, *Water reuse, *Waste water disposal, *Aerated lagoons, Physical control, Highways, Water quality, Flow.
Identifiers: Highway rest areas, Series lagoons, Physical-chemical treatment.

Waste water treatment and disposal practices at interstate highway rest areas were studied. Rest area usage was analyzed to provide information regarding th quantity and quality of waste water as well as the variation in waste water flow. The in-

formation obtained has been used to evaluate potential waste water treatment systems for rest areas. The major criteria used to evaluate the systems were process stability under widely fluctuating loadings, simplicity of operation, and aesthetic qualities. A series lagoon system most nearly satisfies these criteria. An aerated lagoon can be used as the first cell of the lagoon system when land or excavation costs are high, greatly reducing land area requirements. For rest areas having inadequate water supplies, the waste water can be reused for nonpotable uses. A physical-chemical system will produce effluent that will satisfy the quality requirements for nonpotable reuse. This type of system was analyzed for this putpose. Previous phases of the project are summarized. They include an analysis of existing data on the quality and quantity of waste water from interstate highway rest areas and an analysis of potential treatment systems for these waste streams. Laboratory data were obtained for the chemical treatment of the waste water from a rest area and are presented. (Snyder-FIRL)
W76-12855

URBAN RUNOFF POLLUTION CONTROL PROGRAM OVERVIEW: FY'76,
Municipal Environmental Research Lab., Edison, N. J. Storm and Combined Sewer Section.
For primary bibliographic entry see Field 5G.
W76-12857

URBAN STORMWATER RUNOFF: DETERMINATION OF VOLUMES AND FLOWRATES,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W76-12858

RAW SEWAGE COAGULATION AND AEROBIC SLUDGE DIGESTION,
Environmental Science and Engineering, Inc., Gainesville, Fla.
R. H. Jones, T. A. Burnszytnsky, and J. D. Crane.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-249 107, $6.00 in paper copy, $3.00 in microfiche. Report EPA-600/2-75-049, November, 1975. 126 p, 31 fig, 16 tab, 20 ref, 4 append.

Descriptors: *Waste water treatment, *Sewage treatment, *Sewerage, *Biochemical oxygen demand, *Chemical oxygen demand, Treatment facilities, *Sludge digestion, Waste treatment, Waste water(Pollution), Sludge disposal, *Aerobic treatment.
Identifiers: Sludge drying.

Chemical coagulation of raw sewage was studied with laboratory tests and at a sewage treatment plant. A clarifier was converted to a chemical coagulation reactor and clarifier, and polyelectrolyte addition evaluated at various dosages and mixing speeds. Although various polyelectrolytes were efficient in the laboratory, they were less so in full-scale tests due to inadequate mixing. Significant biochemical oxygen demand (BOD) and suspended solids reductions occurred over a range of electrophoretic mobiligy values. Aerobic digestion of primary sewage sludge was also studied at varying detention times, loading rates, temperature, sludge qualities, seasonal flow, evaporation, and precipitation. Aerobic digester waste sludge may contain 40% less chemical oxygen demand (COD), 80% less BOD, 11% less total solids, and 26% less volatile solids than undigested primary sludge. Operating conditions were optimized based on behavior of digested sludge on sand beds. Properly digested sludge dries in 4 weeks with no objectionable odor. Phosphorus was under 0.4% by dry weight, Kjeldahl nitrogen under 3.7%, and nitrate plus nitrite nitrogen under 0.8 mg/gm of dry sludge. COD, BOD, total and volatile solids were reduced 30 to 50% during 70 days lagooning. Aerobically digested sludge seem amenable to mechanical dewatering. Further gravity thickening was unsuccessful for digested primary sludge. Aerobic digestion stabilizes primary sewage sludge very well. Oxygen uptake rates up to 1.8 mg oxygen/(gm TS)(hr) occurred for digestion tests with sludge ages over 20 days. (Snyder-FIRL)
W76-12859

STATE OF THE TECHNOLOGY SEMI-AUTOMATIC CONTROL OF ACTIVATED SLUDGE TREATEMENT PLANTS.
Los Angeles County Sanitation Districts, Whittier, Calif.
C. A. Nagel.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-249 067, $7.75 in paper copy, $3.00 in microfiche. Report EPA-600/2-75-058, December, 1975. 212 p, 59 fig, 14 tab, append.

Descriptors: *Waste water treatment, Analytical techniques, *Treatment facilities, *Automatic control, *Data processing, Waste treatment, Waste water(Pollution), Data storage and retrieval.

Devices that allow waste water treatment plant operators to monitor variable constitutents, calculate important operating parameters, set and maintain proper process controls, and activate alarms are desirable, but present certain problems. The theory, design and operation of continuous on-line instrumentation currently in use by the County Sanitation Districts of Los Angeles County, California are documented, and computer applications which provide daily operational calculations are described. Aspects of instrumentation discussed include water level control of influent pumping, density control of primary sludge pumping, and process air, return sludge and waste sludge control in activated sludge plants. Theory, design, operation characteristics, and maintenance requirements are presented for each system. A computer application system provides daily operational parameters to the operators and prepares a monthly summary of operations reports. Other computer applications are reviewed, and a subroutine to compare effluent characteristics with discharge limits is included. These systems have proven to be reliable and practical. (Snyder-FIRL)
W76-12860

ECONOMICAL RESIDENTIAL PRESSURE SEWER SYSTEM WITH NO EFFLUENT,
SIECO, Inc., Columbus, Ind.
G. F. Hendricks, and S. M. Rees.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-249 195, $5.00 in paper copy, $3.00 in microfiche. Report EPA-600/2-75-072, December, 1975. 73 p, 18 fig, 10 tab, 4 ref.

Descriptors: *Waste water treatment, *Sewage treatment, *Sewerage, *Treatment facilities, *Sewers, Sewage, Sewage disposal, Lagoons, *Indiana.
Identifiers: Pressure sewers, Effluent irrigation, Grandview Lake(Ind).

As the water level in Grandview Lake, Indiana, rose, it became polluted with effluent from septic tanks in the area. A conventional gravity sewer system and treatment plant would have been prohibitively expensive. A pressure sewer system with no polluting effluent was designed, constructed, and monitored for effectiveness. The elimination of groundwater infiltration and restrictive elevation tolerances associated with a conventional gravity sewer system enabled it to be installed and to function economically. Aerobic and anaerobic lagoon storage with subsequent irrigation of the effluent were used for treatment and yielded no more than normal volume of runoff. Inefficient home grinder-pump units resulted in operational problems with the pressure system. Commercially manufactured home units greatly reduced these problems and increases in hor construction resulted, then, the initial irrigati area proved inadequate and additional irrigati areas were made available. Domestic sewa nitrogen and phosphate were largely converted vegetation at a reasonable cost. The treatme method produced no objectionable odors. So additional operation and maintenance proble were caused by ground raw sewage due to the n ture of the solids. Homeowners should be ec cated in the proper operation and maintenance their home units. Any check valves in the ho units should have a gate that, when closed, is at oblique angle from the perpendicular alignment the centerline of the flow in the pipe in order to u the gravitational advantage. Mechanical se should be used when possible in infield fabricati operations to prevent leakage due to high grou water conditions. (Snyder-FIRL)
W76-12861

ULTRAVIOLET DISINFECTION OF A TIVATED SLUDGE EFFLUENT DISCHARGE TO SHELLFISH WATERS,
Clow Corp., Florence, Ky.
J. A. Roeber, and F. M. Hoot.
Available from the National Technical Inform tion Service, Springfield, VA 22161 as PB-249 4 $5.00 in paper copy, $3.00 in microfiche. Rep EPA-600/2-75-060, December, 1975. 93 p, 12 f 13 tab, 7 ref, 6 append.

Descriptors: *Waste water treatment, *Sewa treatment, *Activated sludge, *Sewera *Analytical techniques, Chemical oxygen dema Treatment facilities, *Disinfection, *Ultravio radiation, Shellfish, Turbidity.
Identifiers: Static tests.

A tertiary treatment plant and an ultraviolet di fection chamber were installed following an tivated sludge plant at a municipal sewage tre ment plant. The effluent flows under ultravio lights through troughs. The amount of reaching the bottom of the trough is measured the UV is below a preset point known to g satisfactory disinfection, the effluent is autom cally discharged to a holding lagoon instead of receiving water. After the malfunction is c rected, the lagoon-stored effluent is pumped b through the plant for treatment. The determinat of the coliform most probable number (MPN) the primary evaluation test. MPN was not to more than 70 per 100 ml. In static tests, an aver ultraviolet dose of 25,000 microwatt sec per sq with an exposure time of 120 sec was required produce an effluent with a coliform MPN In less than 70. In flow-through tests, the colif MPN was usually below 70 when the turbidity below 11 JTU. The absorption of ultraviolet ra tion was much more dependent on chemical ygen demand (COD) than on turbidity. Expos of samples to visible light after a sublethal dos ultraviolet exposure favors the continued multi cation of bacteria. Bacteriophage inactivation lowed first order kinetics. Coliform inactivat followed first order kinetics until 99.99% inacti tion; followed by a tailing-off curve. Ultravi disinfection of effluents containing high solids high organics was not possible. (Snyder-FIRL)
W76-12862

TERTIARY TREATMENT FOR PHOSPHOR REMOVAL AT ELY, MINNESOTA A PLANT, APRIL, 1973 THRU MARCH, 1974.
Municipal Environmental Research Lab., Cin nati, Ohio.
J. W. Sheehy, and F. L. Evans, III.
Report EPA-600/2-76-082, March, 1976. 133 p fig, 12 tab, 3 ref, 6 append.

Descriptors: *Waste water treatment, *Treatm facilities, *Sewage treatment, *Sludge dispo *Phosphorus, Operating costs, Operation maintenance, *Minnesota, Lime, Filtration, Te ary treatment, Waste water(Pollution), *Design

tifiers: Chemical removal, *Shagawa
e(Minn), Clarification, Dual-media filtration.

design, the construction and the first year's
ation of the 1. 5 mdg tertirary treatment plant
ted in Ely, Minnesota are discussed. The terti-
reatment plant was constructed to reduce the
unt of phosphorus in the effluent from the ex-
g filter plant, a point source that produces 80%
ie phosphorus and about 1% of the surface
entering culturally eutrophic Shagawa Lake.
tertiary plant was designed and constructed to
ce the total phosphorus concentration in the
ing filter plant effluent to 0.05 mg/liter, and
sts of flow equalization, two-stage lime
fication followed by dual-media filtration and
ination. The cost of treatment averaged
/cu m. Effluent total phosphorus concentra-
veraged 0.045 mg/liter. Performance data for
icility are included. The tertiary influent tank
he manually operated pump controller served
mpen hydraulic variations. The first-stage
clarifier removed an average of 93.5% of the
influent phosphorus, while removal from
tage clarification averaged 98%. The removal
luble phosphorus, particulate phosphorus,
otal phosphorus averaged 3%, 84% and 49%,
ctively. Sludge handling problems encoun-
were high solids in the thickener overflow
o poor settling characteristics of the com-
sludges and odors caused by processing un-
ed sludge. Conditioning sludge with lime in-
d the filter yield by 81%. Pertinent informa-
n suspended solids, turbidity, TOC, calcium
on removal is included. Waste water flow,
cal dose, pH, clarifier solids volume and
filter head loss are described. (Snyder-
2863

LO COUNTY PARK WASTEWATER
AMATION PROJECT. ANTELOPE VAL-
CALIFORNIA,
ngeles County Engineer Dept., Los Angeles,

Brandt, and R. E. Kuhns.
EPA-600/2-76-022, March, 1976. 341 p, 78
tab, 33 ref, 1 append.

ptors: *Waste water treatment, *Treatment
es, *Waste treatment, *Nutrients, *Algae,
c plants, Recreation facilities, Fish, *Water
*California.
iers: Antelope Valley(Calif).

of a full scale demonstration project to
previous pilot studies and research on the
ics and feasibility of reclaiming waste
or use at an aquatic park in a semi-arid area
orted. An oxidation pond tertiary waste
treatment facility involving flocculation
m, sedimentation, filtration, and disinfec-
s constructed. The treatment system per-
ce and the characteristics of the lake
were evaluated as they relate to chemical,
l, and biological quality, algal growth,
owth, fish pathology, soil reclamation, and
n. An effluent was produced that meets all
uality requirements. Alum sludge recycled
the primary treatment plant and sludge
s had no adverse effect on the treatment
es. The water quality in the lakes has a suf-
low nutrient level to avoid eutrophication.
er is also usable for irrigation, but because
gh sodium percentage and the increases in
n and dissolved salts due to evaporation,
ons will be necessary to maintain soil
The completed recreational park attests to
omic benefits and social acceptability of
ter renovation. The tertiary treated water
enically safe, esthetically pleasing, suita-
sh life and aquatic sports, and acceptable
tional use. (Snyder-FIRL)
54

REVIEW AND EVALUATION OF AVAILABLE TECHNIQUES FOR DETERMINING PERSISTENCE AND ROUTES OF DEGRADATION OF CHEMICAL SUBSTANCES IN THE ENVIROMENT,
Syracuse Univ. Research Corp., N. Y. Life Sciences Div.
For primary bibliographic entry see Field 5A.
W76-12865

IMPROVED LIQUID-SOLIDS SEPARATION BY AN ALUMINUM COMPOUND IN ACTIVATED SLUDGE TREATMENT,
Greene County Board of Commissioners, Ohio.
C. F. Lenhart, and J. W. Cagle.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-248 228, $4.50 in paper copy, $3.00 in microfiche. Report EPA-600/2-75-039, September, 1975. 68 p, 34 fig, 3 tab, 9 ref.

Descriptors: *Waste water treatment, *Activated sludge, *Biochemical oxygen demand, *Treatment facilities, *Phosphorus, Sludge digestion, Sewage treatment, Suspended solids, *Separation techniques.
Identifiers: Settling.

The effects of sodium aluminate additions on activated sludge waste treatment were studied. Periods with and without chemical dosing were compared. Feeding sodium aluminate to a small to medium activated sludge waste water treatment plant is practical for gaining several operational benefits, including improved solids handling, easier sludge volume index control, and improved concentration of aerobically digested solids, particularly in cold weather. Sodium aluminate reduced suspended solids carryout of secondary clarifiers, reducing the loading to the microstrainers used for tertiary treatment, and increased sludge density, permitting protection against solids washout during spot flows greater than 164% of designed plant capacity. Phosphorus removal approached 80%; alkaline alumina feed cost $.026 per 1000 gallons of waste water. Flow rates averaging 1.715 to 4.098 million gal per day, from 69 to 164% of design, were treated. Residual benefits accrued for 10 days after aluminate feed stopped; secondary clarifier conditions were not optimum until 3 days to a week after starting the aluminate. Solids settling in aeration basins and secondary clarifiers improved within 24 hr of startup. Thicker return sludge permitted a substantial reduction in waste activated sludge volumes. The secondary clarifier could retain higher MLSS. Return sludge volume rate was lower; less flow volume could deliver the same microorganism quantity. Chlorine demand was reduced; less solids and biochemical oxygen demand (BOD) entered the chlorine tank. BOD and SS loadings to the aeration tanks were reduced and increased concentrations of primary tank solids resulted when alumina was recycled. (Snyder-FIRL)
W76-12867

DESIGN AND TESTING OF A PROTOTYPE AUTOMATIC SEWER SAMPLING SYSTEM,
EG and G Washington Analytical Services Center, Inc., Rockville, Md.
For primary bibliographic entry see Field 5A.
W76-12872

TIOGA RIVER MINE DRAINAGE ABATEMENT PROJECT,
Pennsylvania Dept. of Environmental Resources, Harrisburg.
For primary bibliographic entry see Field 5G.
W76-12874

THE ENVIRONMENTAL IMPACT OF WATER CHLORINATION,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 5C.
W76-12876

CURRENT CHLORINATION AND DECHLORINATION PRACTICES IN THE TREATMENT OF POTABLE WATER, WASTEWATER, AND COOLING WATER,
G. C. White.
In: Proceedings of the Conference on the Environmental Impact of Water Chlorination, October 22-24, 1975, Oak Ridge, Tennessee, Oak Ridge National Laboratory, p 7-24. 11 ref.

Descriptors: *Waste water treatment, *Sewage treatment, *Treatment facilities, *Chlorination, *Water treatment, *Activated sludge, Disinfection, Hydrogen sulfide, Cooling water.
Identifiers: Dechlorination.

In sewage treatment, chlorine is used primarily for disinfection, but it is also effective for the prevention of septicity and the control of hydrogen sulfide generation. It is also used in limited applications such as control of activated sludge, bulking, sludge thickening, the destruction of cyanides, and foul air scrubbing. Chlorine is used in manufacturing ferric chloride, which is an effective coagulant for both potable water and waste water treatment. The amount of chlorine applied varies greatly, 50 to 400 lb per million gallon for waste water as compared to 5 to 100 lb per million gallon for potable water and 20 to 200 lb per million for cooling water. In the final analysis the required use of chlorine in potable water and waste water depends on local and Environmental Protection Agency regulatory requirements. It was stated that there is no alternative to chlorine as a disinfectant and chemical tool in the treatment of potable water, waste water, and cooling water. While there appear to be some disadvantages such as the formation of some undesirable chloro-organics, no other oxidant can combine all chlorine's positive attributes, such as its potency and wide range of effectiveness as a germicide, and its ease of handling, application, measurement, and control. (See also W76-12876) (Snyder-FIRL)
W76-12877

THE CHEMISTRY OF AQUEOUS CHLORINE IN RELATION TO WATER CHLORINATION,
Harvard Univ., Cambridge, Mass. Div. of Engineering and Applied Physics.
For primary bibliographic entry see Field 5C.
W76-12878

MEASUREMENT AND PERSISTENCE OF CHLORINE RESIDUALS IN NATURAL WATERS,
North Carolina Univ. at Chapel Hill. Dept. of Environmental Sciences and Engineering.
For primary bibliographic entry see Field 5A.
W76-12879

ORGANO-CHEMICAL IMPLICATIONS OF WATER CHLORINATION,
Minnesota Univ., Duluth. Dept. of Chemistry.
For primary bibliographic entry see Field 5C.
W76-12880

CHLORINATION OF ORGANICS IN COOLING WATERS AND PROCESS EFFLUENTS,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 5A.
W76-12882

ANALYSIS OF NEW CHLORINATED ORGANIC COMPOUNDS FORMED BY CHLORINATION OF MUNICIPAL WASTEWATER,
North Texas State Univ., Denton. Inst. of Applied Sciences.
For primary bibliographic entry see Field 5A.
W76-12883

CHLORINATED COMPOUNDS FOUND IN WASTE-TREATMENT EFFLUENTS AND THEIR CAPACITY TO BIOACCUMULATE,
Minnesota Univ., Duluth. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W76-12891

MICROBIOLOGY - DETECTION, OCCURRENCE, AND REMOVAL OF VIRUSES, (LITERATURE REVIEW),
Environmental Research Center, Cincinnati, Ohio.
For primary bibliographic entry see Field 5A.
W76-12896

LABORATORY EVALUATION OF POLYMERIC FLOCCULANTS,
McMaster Univ., Hamilton (Ontario). Dept. of Chemical Engineering.
A. Benedek, and J. J. Bancsi.
Journal of the Environmental Engineering Division-ASCE, Vol. 102, No. EE1, p 17-28, February, 1976. 10 fig, 18 ref, 1 append.

Descriptors: *Waste water treatment, *Analytical techniques, *Treatment facilities, *Laboratory tests, *Laboratory equipment, Flocculation, Polymers, Sampling, Settling velocity, *Pollutant identification.

An adaptation of the method of multiple sampling during quiescent settling was used to study flocculation. A 35 cm high batch settling apparatus was used. It included a sampling tube 7.62 cm from the bottom surface and a stirring apparatus. Waste water with coagulant was mixed rapidly for 6 min, then slowly for 14 min. Any polymers used were added at 5 min. After the 20 min of mixing, the mixture was sampled automatically for 40 min as it settled. A Cahn Electro Balance was also used to determine the settling velocity distribution without sampling. An 8 ft high long tube settler was also used to simulate full-scale clarifiers where flocculation can take place during the entire downward passage of a floc. The modified jar test successfully yielded velocity size distributions. Settling in the batch settling apparatus is not affected by sampling errors. Phosphorus precipitate and other suspended solids enmesh in a chemical floc. Phosphorus and suspended solids concentrations are equally effective for monitoring settling. Comparison with results from the long tube settler indicates that the settling rates calculated from the batch settling apparatus test tend to be conservative due to lack of allowance for flocculation during settling. At least 5 min of rapid mix between coagulant and polymer addition, 1 min rapid mix after polymer addition, and 4 min of slow mix for flocculation are recommended for chemical flocculation studies in the batch settling apparatus. (Snyder-FIRL)
W76-12898

NASA TO TEST NEW TECHNIQUES FOR ON-STREAM WATER MONITORING.
For primary bibliographic entry see Field 5A.
W76-12900

INSTRUMENTATION AND AUTOMATION OF WASTEWATER COLLECTION AND TREATMENT SYSTEMS, (LITERATURE REVIEW),
Municipal Environmental Research Lab., Cincinnati, Ohio.
R. H. Wise, J. F. Roesler, and I. J. Kugelman.
Journal Water Pollution Control Federation, Vol. 48, No. 6, p 1206-1217, June, 1976. 138 ref.

Descriptors: *Automation, *Automatic control, *Waste water treatment, *Treatment facilities, *Instrumentation, Sampling, Monitoring, Flow measurement, Computers, Equipment, Activated sludge, Data processing, Flow control, Reviews, *Bibliographies.
Identifiers: Collection systems, *Literature reviews.

A review of literature dealing with the instrumentation and automation of waste water collection and treatment systems is presented. Topics covered include: guidelines for selecting on-line process analyzers, design improvements in on-line gas chromatographs, an automatic sampling and monitoring system for detecting accidental spills or other abnormally high discharges in industrial sewers, the evaluation of a commercial venturi that uses metal-membrane protected piezometers to detect fluid pressure changes, waste water treatment and water pollution abatement applications of a sonar-in-air liquid flow meter, the usefulness of existing optical methods for measuring turbidity, developments in control valves and flow control technology, the advantages of solid-state timing devices over electromechanical switches and timers, approaches to the real-time control of waste water variables, the design of fully automated water treatment plants, the use of computer control in an automated activated sludge plant, and criteria for selecting a data acquisition system. (Kreager-FIRL)
W76-12901

HOW TO DESIGN AERATED LAGOON SYSTEMS TO MEET 1977 EFFLUENT STANDARDS - EVALUATION OF KINETIC COEFFICIENTS,
Clemson Univ., S.C. Dept. of Environmental Systems Engineering.
L. G. Rich, and S. C. White.
Water and Sewage Works, Vol. 123, No. 6, p 90-92, June, 1976. 5 fig.

Descriptors: *Oxidation lagoons, *Aeration, *Waste water treatment, *Kinetics, *Mathematical studies, Dissolved oxygen, Biochemical oxygen demand, Organic compounds, Suspended solids, Biological treatment, Equipment, *Design criteria, *Water quality standards.

Laboratory techniques and mathematical methods for estimating kinetic coefficients associated with the design of aerated lagoon systems are described. Retention time and power input are cited as the two main features of lagoon design. The selection of the former is based on a knowledge of which retention time provides the best solids removal with sedimentation for a particular waste and on the rate of soluble organic removal. The selection of power input is based on the amount of oxygen needed for respiration and biological conversion of the waste water and on the mixing requirements. Laboratory equipment and calculation procedures are illustrated for estimating changes in respiration rates and soluble biochemical oxygen demand, dissolved oxygen depletion rates, substrate removal rates, and respiration coefficients. (Kreager-FIRL)
W76-12903

ESTIMATING THE RELIABILITY OF ADVANCED WASTE TREATMENT,
Environmental Protection Agency, Cincinnati, Ohio.
R. B. Dean, and S. L. Forsythe.
Water and Sewage Works, Vol. 123, No. 6, p 87-89, June, 1976. 4 fig, 2 tab.

Descriptors: *Statistical methods, *Reliability, *Tertiary treatment, *Waste water treatment, *Water quality, Phosphates, Mathematical studies, Evaluation, Performance, Treatment facilities, *Estimating.

Statistical methods for estimating the reliability of advanced waste water treatment plants are discussed. Since the usual measurements of pollutants in waste water are lognormally distributed, plotting the data as a normal distribution is not appropriate and the plotting of cumulative probability distributions on log-probability paper becomes necessary. If a population can be fitted by a log-normal distribution, predictions about future performance can be made with a high degree of co fidence provided that the process is in statisti control (variations appear to result from consist causes). Data on phosphate levels are taken fr an advanced waste water treatment plant and plotted normally and as their logarithms. The la case produces a straight line, with a median va of 0.19 milligrams/liter and a spread factor of The median is a good estimate of the geome mean. (Kreager-FIRL)
W76-12904

COMPUTER HALTS FLOODING CO PLAINTS,
Watermation, Inc., Saint Paul, Minn.
D. J. Anderson, and R. O. Meyers.
Water and Wastes Engineering, Vol. 13, No. 27-28, 30, 32, 62, June, 1976. 4 fig.

Descriptors: *Sewers, *Overflow, *Mathemat models, *Computer programs, *Floo *Combined sewers, Analytical techniques, Co Economics.

The use of a computerized mathematical mode analyze flooding problems and raw sewage o flow has resulted in a cost savings amountin two-thirds that of replacing the sewer system the city of Lakewood, Ohio. The mathema model used to analyze the city's sewer systen volved three routines. One routine calculated amount of rainfall which enters the sewers f the streets, rooftops, and grassed areas; ar second routine determined the amount of flow to the environment at various regulators in system. A third routine computed the travel for a given flow rate to traverse a pipe from the stream to the downstream end. The alterna solution to sewer system replacement selected result of the computerized analysis involved installation of 10 new control regulators to re combined sewer overflow at a cost of about million. (Kreager-FIRL)
W76-12905

VALUE ENGINEERING: MAKE SURE COSTS ARE RIGHT,
Minges (James S.) and Associates, Inc., Farm ton, Conn.
H. M. Wexler.
Water and Waste Engineering, Vol. 13, No. 34-36, 38, 49, June 1976. 5 fig.

Descriptors: *Cost-benefit analysis, *C *Benefits, *Economics, *Waste water treatm *Treatment facilities, Construction costs, M tenance costs, Operating costs, Replace costs.
Identifiers: *Value engineering.

Value engineering, a systematic approach achieve cost savings without sacrifice of ben is discussed in relation to sewage treatment pl The objective of value engineering for se treatment plants is to minimize life-cycle which consist of the initial construction cos the facility as well as maintenance, operation replacement costs. It is imperative that a fo value engineering program be initiated as ear possible, especially before important design cept such as secondary treatment processes, ary filtration methods, types of lift stations, of building and process heating, and piping materials are finalized. An example of the ap tion of value engineering to the upgrading waste water treatment serving a populatio about 20,000 is presented and reveals that i particular case the abandonment of existing ling filters in favor of rotating biological co tors results in up to a 50% savings in elec energy consumption and more consistent formance. (Kreager-FIRL)
W76-12906

LIBRARY OF THE UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN

PULATION BALANCE USE IN DILUTE IM-
RITY PROBLEMS,
va State Univ., Ames. Dept. of Nuclear En-
eering; and Iowa State Univ., Ames. Dept. of
emical Engineering.
r primary bibliographic entry see Field 5B.
6-12914

ALUATION OF THE REPORT ON INTER-
PTOR SEWERS AND SUBURBAN SPRAWL.
vironmental Protection Agency, Washington,
C. Office of Planning and Evaluation.
ailable from the National Technical Informa-
Service, Springfield, VA 22161 as PB-250 617,
00 in paper copy, $3.00 in microfiche. January,
5. 43 p, 4 tab, 6 append.

criptors: *Waste water treatment, Analytical
niques, *Sewerage, *Flow rates, *Interceptor
ers, Projects, Land use, Land development,
ign, Human population, *Sewers, Evaluation.
ntifiers: Excess capacity.

Environmental Protection Agency (EPA) study
up evaluated the conclusions of the Urban
tems Research and Engineering, Incorporated
R+E) report for the Council on Environmen-
Quality, INTERCEPTOR SEWERS AND
BURBAN SPRAWL. The report, based on an
ysis of 52 interceptor projects and case studies
n the larger sample, concluded that the
ence of Federally financed interceptor sewers
ourages development, and their routing, sizing,
timing influence land use patterns. It also con-
es that current procedures and standards for
gn, review, and financing of projects strongly
ourage unnecessarily large interceptor projects
do not stimulate public participation or ensure
ful assessment of potential adverse secondary
cts and recommends that EPA not provide
eral funds for excess capacity, re-evaluate in-
ptor staging of projects in rapidly growing
s, use realistic standards for estimating per
a flow, improve population forecasting
niques and review procedures, require coor-
ion of environmental effects of interceptor
ced land use, and increase public participation
ublicizing community cost and benefits of in-
ptor induced growth. The EPA group's 74
ct survey agreed that half the land served by
ceptor projects is vacant, but much of this
ring was unavoidable. The EPA disagrees
limiting interceptor design life to 25 yr,
use some projects are likely to be more cost
tive with longer periods. EPA agrees that no
rary gpcd standards should be set; factors like
ined sewers and high infiltration/inflow
ied several seemingly excessive design flows.
EPA group agrees that population forecasting
d be improved but finds the recommendation
nit financial aid to the portion of interceptors
ed for current population inappropriate.
ler-FIRL)
12915

ENERGY NEEDS - A PRIME CONCERN,
ge County Water District, Fountain Valley,
Board of Directors.
Argo, and C. M. Wesner.
r and Wastes Engineering, Vol. 13, No. 6, p
June, 1976. 2 tab.

iptors: *Reclamation, *Waste water treat-
*Energy budget, *Tertiary treatment,
tment facilities, *Electric power demand,
imed water, Water reuse, Energy.

le energy requirements associated with the
ion of an advanced waste water treatment
n Orange County, California are reviewed.
dary effluent not reclaimed by the plant is
rged into the Pacific Ocean by pumping
h an outfall and requires about 3000
tt-hours/day for 15 mgd of effluent. The
naximum energy required to reclaim 15 mil-
llons/day of waste water is 95,000 kilowatt-hours without demineralization and 130,000 kilowatt-hours/day with demineralization by reverse osmosis. These energy requirements include all treatment units and auxiliaries, such as plant water and lighting; also included are all energy requirements to manufacture and deliver consumable supplies used in the waste water reclamation process. A detailed breakdown of energy requirements is given by unit operation. (Kreager-FIRL)
W76-12919

STIMULATION OF DENITRIFICATION IN SOIL COLUMNS BY ADDING ORGANIC CARBON TO WASTEWATER,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
J. C. Lance, and F. D. Whisler.
Journal Water Pollution Control Federation, Vol. 48, No. 2, p 346-356, February, 1976. 7 fig, 2 tab, 19 ref.

Descriptors: *Denitrification, *Carbon, *Waste water treatment, *Soil filters, *Recycling, Symbiosis, Nitrification, Nitrogen, Efficiencies, Filtration, Chemical reactions, Organic compounds, Evaluation, Simulation analysis.
Identifiers: Dextrose.

Soil columns were intermittently flooded with waste water adjusted to different soluble carbon concentrations by adding dextrose or methanol to investigate the effect of organic carbon on denitrification. Methanol was not effective in promoting denitrification in soil columns flooded with secondary waste water; however nitrogen removal was increased from 30-90% by increasing the soluble carbon concentration of the waste water to 150 mg/liter via the addition of dextrose. This showed that the organic carbon content of waste water is capable of limiting denitrification in high-rate land filtration systems and that both nitrification and denitrification may be achieved in the same soil profile by alternating flooding and drying periods. Further research is needed to determine if most of the carbon would be removed from primary waste water effluent by high-rate land filtration and to determine if denitrification can be stimulated by adding carbon in a pulse at the beginning of the flooding period. (Kreager-FIRL)
W76-12920

AIRBORNE COLIPHAGES FROM WASTEWATER TREATMENT FACILITIES,
Michigan Univ., Ann Arbor. School of Public Health.
For primary bibliographic entry see Field 5A.
W76-12921

MOGDEN, WHERE SEWAGE WORKS,
C. W. Ireland.
Gas and Oil Power, Vol. 71, No. 787, p 161-162, Winter, 1975. 2 fig, 1 tab.

Descriptors: *Waste water treatment, *Sewage treatment, *Sludge digestion, *Treatment facilities, *Gases, *Fuels, Equipment.
Identifiers: Thames Water Authority, Mogden water works.

Fuel gas for engines is produced from the treatment of sewage at the Thames Water Authority's Mogden works. Heat recovered from the engine cooling systems raises the sludge digestion temperature to about 32C. The engines drive generators for electric pumps and other equipment and air compressors delivering about 4.8 million cu m/day to the activated sludge process. The engine commissioned in 1967 was developed taking into account the difficulties of burning the very heavily contaminated sludge gas, and incorporated numerous special features. The fuel gas carries large quantities of condensate due to the close proximity of the digester to the power house. Operating experience made it possible to develop the most efficient combination of engine components, which included many standard components. This experience allowed the engine installed in 1974 to be designed with components interchangeable with those of the 1967 engine. The 1974 engine also incorporated various improvements. The gas and air are mixed in the combustion chamber to avoid any possibility of an explosive mixture being formed in the manifold. The 1974 engine ran almost continuously for its first 12 months. Both engines are dual fuel engines; a pilot injection of diesel fuel oil promotes ignition of the gas and air. (Snyder-FIRL)
W76-12923

DISINFECTION, (LITERATURE REVIEW),
Georgia Inst. of Tech. Atlanta. School of Civil Engineering.
For primary bibliographic entry see Field 5F.
W76-12924

DETERGENTS, (LITERATURE REVIEW),
Missouri Univ., Columbia.
For primary bibliographic entry see Field 5C.
W76-12925

FREEZE TREATMENT OF ALUM SLUDGE,
Envirotech Corp., Salt Lake City, Utah. EIMCO BSP Div.
For primary bibliographic entry see Field 5E.
W76-12928

SANITARY LANDFILL LEACHATES AND THEIR TREATMENT,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
E. S. K. Chian, and F. B. DeWalle.
Journal of the Environmental Engineering Division-ASCE, Vol. 102, No. EE2, p 411-431, April, 1976. 5 fig, 6 tab, 52 ref, 1 append.

Descriptors: *Waste water treatment, *Pollutant identification, *Biological treatment, *Analytical techniques, Biochemical oxygen demand, Chemical oxygen demand, *Landfills, *Leachate.
Identifiers: Physico-chemical treatment.

Leachate samples were collected from landfills in different parts of the United States and analyzed for both organics and inorganics. Ratios such as COD/TOC, BOD/COD, VS/FS, and total carbon present in the free volatile fatty acids/TOC were determined for the leachate. These ratios can be used to predict the effectiveness of either biological or physico-chemical treatment methods with a given leachate. Some are also used as an internal check on the reliability of the results of chemical analysis of leachate samples. Leachate from recently leaching landfills is best treated by biological treatment, which is most effective in removing the free volatile fatty acids which are present in large quantities. Physical-chemical treatment is most effective for treating leachate from stabilized landfills or further removing organic matter in the effluent of biological units treating leachate. Activated carbon and reverse osmosis were best among the physico-chemical processes evaluated for removing organic matter. (Snyder-FIRL)
W76-12930

CALCIUM HYDROXIDE (LIME) AND THE ELIMINATION OF HUMAN PATHOGENIC VIRUSES FROM SEWAGE: STUDIES WITH EXPERIMENTALLY CONTAMINATED (POLIOVIRUS TYPE 1, SABIN) AND PILOT PLANT SAMPLES,
Ottawa Univ. (Ontario). Faculty of Medicine.
S. A. Sattar, S. Ramia, and J. C. N. Westwood.
Canadian Journal of Public Health, Vol. 67, No. 3, p 221-226, May-June, 1976. 4 tab, 12 ref.

Descriptors: *Waste water treatment, *Sewage treatment, *Sewerage, *Pollutant identification, *Lime, *Viruses, Sewage sludge, Waste storage, Temperature, Public health, Pilot plants, *Calcium hydroxide, Chemical precipitation.
Identifiers: Chemical treatment.

Use of lime was studied as a means to eliminate viruses from sewage. Sewage samples were contaminated with poliovirus 1. An aqueous slurry of lime was then added drop by drop until the pH reached 11.5. After 15 more min of stirring, the sample was allowed to stand for one hr. No virus was detected in the resulting supernatant; the virus recovered from the sludge represented only 0.001% of the virus added. This remaining virus was undetectable after storing the sludge for 24 hr at 28C. Lowering the temperature of the samples to 4C did not affect the process efficiency in eliminating viruses. (Snyder-FIRL)
W76-12931

ODOR CONTROL WITH HYDROGEN PEROXIDE,
Pennsylvania State Univ., Middletown. Dept. of Engineering.
C. A. Cole, P. E. Paul, and H. P. Brewer.
Journal Water Pollution Control Federation, Vol. 48, No. 2, p 297-306, February, 1976. 5 fig, 3 tab, 5 ref.

Descriptors: *Waste water treatment, Pollutant identification, *Treatment facilities, Odor, Control, Domestic wastes, Industrial wastes, Effluents, Hydrogen sulfide.
Identifiers: *Odor control, *Hydrogen peroxide, Clarifiers.

Hydrogen peroxide treatment was investigated as a method of controlling the odors emanating from the Hershey waste water plant, which treats approximately 2 mgd of domestic and industrial waste. The plant odors came predominantly from the flotator-clarifier effluent that was aerated in the preaeration tank and exposed to air in the plastic media trickling filter and from the intermediate clarifier effluent that was exposed to air in the intermediate rock trickling filter. Hydrogen sulfide produced under anaerobic conditions in the flotator-clarifier and intermediate clarifier apparently produced the odor. Two winter tests followed by continuous use starting in the early summer demonstrated the effectiveness of hydrogen sulfide for controlling the odor. A dose of between 15 and 40 mg/liter hydrogen peroxide divided between the effluent from the plastic media trickling filter and the feed to the flotator-clarifier was effective. On-site observations and off-site tests by an odor panel verified the odor reduction. Adding 10 mg/liter hydrogen peroxide to the feed of the flotator-clarifier and intermediate clarifier during the afternoon high flow time increased the dissolved oxygen (DO) in the effluent of each by one to 2 mg/liter. Adding 10 mg/liter hydrogen peroxide did not improve the early morning low flow DO. (Snyder-FIRL)
W76-12932

THE ECONOMICS OF RECOVERY OF MATERIALS FROM INDUSTRIAL WASTE--A CASE STUDY,
Aston Univ., Birmingham (England). Dept. of Chemical Engineering.
A. V. Bridgwater.
Resource Recovery and Conservation, Vol. 1, No. 2, p. 115-127, 1975.

Descriptors: *Byproducts, *Industrial wastes, *Financial feasibility, *Recycling, *Return(Monetary), Chemical wastes, Europe, Water pollution control, Liquid wastes, Economies of scale, Waste treatment, Organic compounds, Metals.
Identifiers: West Midlands(England).

The viability of recovering materials from liquid and liquid-solid industrial wastes is evaluated. A waste disposal contractor in the West Midland, usually poured acid effluents into old coal mine shafts and phenolic wastes and metal-bearing sludges onto a brickpit surface. Effluents were analyzed for suitability before discharge, except that aqueous cyanide solutions were first oxidized with chlorine. Monitoring of liquids and atmosphere in the mine shaft indicated some acid neutralization and metal adsorption by the rocks occurred. Analyses of effluents and prices of materials contained in or derivable from effluents showed that hydrochloric acid, zinc, and non-ferrous metals were present in relatively large quantities, were the most valuable, and are relatively easy to recover. Preliminary studies for recovery of commercial hydrochloric acid indicated that for acid alone a return of more than 50% might be expected with a payback time of less than two years. For zinc oxide recovery the return was estimated at around 25% with a payback time of about three and a half years. An integrated approach to effluent treatment and material recovery rather than disposal would be more economical, reduce losses of valuable materials, preserve safe disposal sites for intractable wastes, and provide fast, efficient recycling of valuable materials. The attractiveness of recycling nickel and white spirits are illustrated. (Buchanan-Davidson--Wisconsin).
W76-12948

SOLID WASTE: IS THERE A PROFIT POTENTIAL,
Waste Management, Inc., Oak Brook, Ill.
T. Bakkom.
Pollution Engineering, Vol. 7, No. 11, p. 38-39, 1975.

Descriptors: *Recycling, *Industrial wastes, *Waste disposal, *By products, Methodology, Performance, Economic efficiency, Marketing.

The recovery of marketable materials from industrial wastes is contingent on efficient collection, storage, and transportation systems designed for the special production needs, volumes, and hazards of the wastes. Plant production should be studied to identify recoverable materials and determine feasibility of recovering waste fractions for recycling or sale. Recoverable material must be maintained at its maximum value. Containerization, storage, handling, and transportation systems for recoverable and unrecoverable materials from the point of waste generation to their final disposition must be planned. A case study of an international manufacturer and marketer of heavy equipment is presented. Because of environmental problems caused by incineration, alternative methods of waste handling and disposal were chosen. The improved system solved the environmental problem, used less manpower, reduced costs, used a private contractor's ability to recover secondary fibers for resale, handled waste without changing operating procedures or interrupting production, and met all solid waste demands with permitted disposal sites. The system is not currently considered as a 'profit center' but it does reduce the cost of waste handling and disposal--subject to the marketability of the recovered materials--and meets the primary criteria of efficiently removing wastes from production areas. (Buchanan-Davidson--Wisconsin)
W76-12951

PRELIMINARY ASSESSMENT OF SYSTEMS FOR DERIVING LIQUID AND GASEOUS FUELS FROM WASTE OR GROWN ORGANICS,
National Aeronautics and Space Administration, Cleveland, Ohio. Lewis Research Center.
R. W. Graham, T. W. Reynolds, and Y. Y. Hsu.
Report No. NASA TN D-8165, February 1976. 41 p. 10 fig., 6 tab., 33 ref.

Descriptors: *Fuels, *Recycling, *Feasibility studies, *Energy conversion, Organic wastes, *Anaerobic digestion, Environmental effects, Pilot plants, Vegetation, Farm wastes, Agriculture, Forests, Economic feasibility, Methane, Technology, Costs, Waste treatment
Identifiers: *Pyrolysis system

The overall feasibility of anaerobic digestion an pyrolysis systems to convert fuels from waste o grown organics is considered as related to th technical, economic and environmental aspect Converting collectable organic waste into fuels ap pears attractive with the added advantage of was disposal. The most conservative estimates indica that 136 million tons/yr is 'readily collectable representing 1.4 in the 15th power Btu/yr; tot U.S. energy consumption in 1971 was 72 in th 15th power Btu/yr. However conversion to liqu or gaseous fuels would reduce the energy conte by the conversion efficiency. In the grown organ option, silviculture as a source of biomass for fu conversion is evaluated and found that at a 50 conversion efficiency the costs of fuel would e ceed the current cost of petroleum. Fuel cr production is not a viable alternative but bioma waste from food crops can be considered as realistic fuel resource. The two conversio processes-fermentation and pyrolosis--are co pared with regard to capital investment, enviro mental impacts, and their versatility. The ener from a system that uses waste and grown organ feedstocks is estimated at 4% to 12% of the 19 U.S. energy consumption. Estimates of mark prices for these fuels are included. (Auen-Wisco sin).
W76-12967

SOLAR ENERGY FIXATION AND CONVE SION WITH ALGAL BACTERIAL SYSTEMS,
California Univ., Berkeley. Sanitary Engineeri Research Lab.
M. Uziel, W. J. Oswald, and C. G. Golueke.
Available from the National Technical Inform tion Service, Springfield, VA 22161 as PB-242 36 $3.50 in paper copy, $3.00 in microfiche. Progre Report No. NSF-RA-N 74-195, December 1974. p. 1 fig., 4 tab. NSF-RANN-SE GI-39216.

Descriptors: *Electric power productio *Methane, *Energy conversion, *Solar radiatio Anaerobic digestion, Waste treatment, Recyclin Scenedesmus, Euglena, Laboratory tes Nitrogen, Harvesting of algae, Fermentatio Cyanophyta, Chlorophyta, *Economic feasibilit Identifiers: Spirulina, Melosira, Oscillator Micractinium, *Solar energy fixation, *Solar en gy conversion.

The results of continuing laboratory tests co ducted to determine the economic feasibility o process based on the utilization of algal-bacter cultures in sewage to fix solar energy into algal c lular material, which in turn is converted methane by anaerobic digestion; the methane to used through combustion for the generation electricity. Implicit in the recycling aspects are t utilization of wastes and a source of nitrogeno fertilizer. This phase of the investigation produc data for the kinetic modeling of algae and metha production (anaerobic digestion) processes, a energy transformations; and the assessment of t comparative fermentability of Melosi Scenedesmus, Euglena, Micractinium, Spirul and Oscillatoria. The overall results indicate th with the exception of Melosira, all the spec tested could serve equally well as a fermentati substrate for gas production. The methane conc tration of the gas produced ranged from 69% 71% of the total gas. The stability and reliability the system was well demonstrated. Gas compo tion is not affected by type of algae ferment Nitrogen is supplied by the sewage and/or mospheric fixation by the blue-green algae. A nitrogen introduced into the system can be ke within the system by recycling digester effluent the algae ponds. (Auen-Wisconsin).
W76-12968

OSPHORUS REDUCTION WITH BIVALENT
ON SULFATE AT THE KAPPALA WATER
RIFICATION PLANT, (IN SWEDISH)
ppalaverket, Lidingo (Sweden).
. Dahlqvist, L. Hall, and L. Bergman.
ten. 31(2), p 166-179, 1975.

criptors: *Water purification, *Water treat-
nt, *Sewage treatment, *Phosphorus, Ac-
ted sludge, *Waste water treatment.
ntifiers: Kappala plant, *Sweden(Kappala
nt), *Ferrous sulfate.

rous sulfate is useful for phosphorus reduction
ewage plants. The quantities needed for water
fication at the Kappala plant (Sweden), the ef-
on suspended matter, the relation to oxygena-
, surplus slime, loss of phosphorus in water
tment tanks, the changes in gas production and
position and the effect on activated sludge
e studied. Phosphorus reduction of 90% was
eved with 16-18 g iron/m3. Activated sludge
unaffected; gas production remained
anged. Ferric hydroxide tended to clog aera-
tubes, but this was easy to prevent.–Copy-
1976, Biological Abstracts, Inc.
-12989

/AGE EFFLUENT TURNED TO SNOW:
VIDES STORAGE, REMOVES POLLU-
TS,
ht-McLaughlin Engineers, Denver, Colo.
. Wright.
Engineering - ASCE, Vol. 46, No. 5, May
, 88-89. 1 tab.

riptors: *Waste water disposal, *Waste water
ment, *Solid waste, *Snow, *Effluents,
hemical oxygen demand, Hydrogen ion con-
ration, Suspended solids, Phosphate,
ites, Nitrogen, *Colorado, Water quality.
ifiers: *Clean Water Bill, *Total dissolved
s, *Winter storage, Yama River(CO), Routt
ty(CO), Land treatment, Nitrate-nitrogen.

eet the goals of the Clean Water Bill (PL 92-
for 1983 and 1985, and maintain classification
e Yama River (CO) as a cold water fishery,
Upper Yama Water Conservation District in-
gated the possibility of land application of
ed sewage effluent as an alternative to reser-
storage. Small mountain area municipalities,
esorts and mountain top restaurants would
converting effluent to snow useful for practi-
inter storage and to decrease pollutants in the
ss. The experiment was carried out in
ary through April 1974 at a ski area in
ado. The Mt. Werner Sewage Treatment
ed lagoon liquid effluent was converted to
by means of conventional snow making
Tests were made on the snow-melt using as
ing criteria: 5-day biological oxygen demand
), total dissolved solids (TDS), total
nded solids, nitrate-nitrogen, total
hate, and pH. The snow was slightly off-
in color with no noticeable odor. Com-
ns between snow pack and wastewater
ed in the following conclusions: fecal
rm bacteria in snow pack was less than 200
0 ml, within limits of an A classical stream;
to 2.5 months in snow pack TDS concentra-
decreased by an average of 85%; after 1 to
nths there was 91% BOD removal within the
pack; over a period of 2 months pH
sed from 7.9 to 7.0. (Gentry-North Carolina)
3048

ENT-DAY AND FUTURE PROBLEMS
ERNING THE PURIFICATION OF
R USED IN RAISING PIGS, (IN
CH),
tul de Studii, Cercetari si Proiectari Pentru
darirea, Bucharest (Rumania).
riac, I. Gueron, and C. Negulescu.
cad Sci Agric For. 3, p 79-89, 1973.

Descriptors: *Waste water disposal, Waste disposal, *Waste water treatment, Europe, Water purification, Separation techniques, *Hogs, *Farm wastes, Waste treatment.
Identifiers: *Romania.

Traditionally, in raising farm animals, the problem of waste disposal has been solved by utilizing the waste in liquid or solid form as agricultural fertilizer. The quantity of waste material that can be so used is limited since the overmanuring of land is unfavorable for crops. There is also the danger that large quantities of pollutants may enter natural waters. In modern pig raising centers comprising herds of 100,000 animals, the litter is evacuated hydraulically, a process that uses 3000-4000 m3 of water/day. The resulting pollution is equivalent to a town of 200,000-300,000 inhabitants. Such large units usually do not have access to fields large enough (3000-4000 ha) to dump their litter. Dumping the waste water into a river is usually not possible, except after mechanical and biological purification to avoid serious pollution. Technological processes to solve such problems follow in general those of urban water purification plants; these involve separation of solids, settling ponds, chlorination, incineration, dehydrating muds, agricultural uses and composting. The operation of several stations in Rumania is described.–Copyright 1975, Biological Abstracts, Inc.
W76-13055

ENVIRONMENTAL CONTROL IN PLANTS AT MINIMUM COST,
C. D. Burnham.
Water and Pollution Control, Vol. 114, No. 6, p 6-8, 9, June, 1976. 4 fig.

Descriptors: *Water pollution control, *Industrial wastes, *Water reuse, *Design criteria, *Byproducts, Operations, Economics, Toxicity, Drainage systems, Equipment, Materials, *Waste water treatment.

Design and operating practices for controlling water pollution from waste treatment operations at a minimum cost are reviewed. The most effective way to eliminate pollution is at the source by means of raw material, process, and/or equipment changes. For example, the use of countercurrent double rinse tanks that require water addition only when the rinse water is too dirty can reduce drainage system requirements in the metal finishing industry. Segregation of drainage systems can be used to avoid the discharge of possible toxic combinations. Site selection is another factor in achieving environmental control at minimum cost; care should be exercised to avoid building a facility on a flood plain. Water reuse is a pollution control technique which also can provide valuable byproducts and an inexpensive source of process water. An example of water reuse in a cresylic acid plant is presented. (Kreager-FIRL)
W76-13056

LATEST U. S. SEWAGE REGULATIONS,
W. F. Roberts.
Marine Engineering/Log, Vol. 81, No. 6, p 34-37, June, 1976. 2 fig.

Descriptors: *Waste water treatment, *Sewage treatment, *Biological treatment, *Sewerage, *Treatment facilities, *Regulation, Ships, *Water quality standards.

Legal terms relating to shipboard sewage treatment are defined. Only sewage and other waste water coming into contact with it are required to be treated. The three basic negative effects of dumping raw sewage from vessels are the visual insult of raw sewage, the health hazard from pathogenic organisms and the pollution problems, such as oxygen depletion of the water. The harmful effects of vessels on the open seas are marginal, but serious problems can be caused in estuaries, bays, rivers, and lakes. Flow-through sewage treatment is now allowed for all oceangoing vessels. Tests and certification are required for these systems. Possible marine sanitation devices (MSD's) to meet the regulations include a holding tank, vacuum or pressure flushing, total incineration, maceration/chlorination, biological flow-through treatment, physical-chemical flow-through treatment, recycling, and individual unitized toilets. Operational considerations include as much automatic operation as possible, a minimum of sewage treatment skills required, minimum use of expendables, reliability, ease of maintenance, minimizing personnel objections, and elimination of need for shore accomodations. Different systems are more appropriate in different situations. A compilation of manufacturer's information on MSD's is included. (Snyder-FIRL)
W76-13057

TWO-DIMENSIONAL WATER QUALITY MODELING AND WASTE TREATMENT OPTIMIZATION FOR WIDE, SHALLOW RIVERS,
Wisconsin Univ., Madison.
For primary bibliographic entry see Field 5B.
W76-13058

A BRIEF HISTORY OF SEWAGE TREATMENT - 2 THE ROYAL COMMISSION,
For primary bibliographic entry see Field 5G.
W76-13060

VIRUSES IN WASTE, RENOVATED, AND OTHER WATERS. 1974 LITERATURE ABSTRACTS,
National Environmental Research Center, Cincinnati, Ohio.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-245 957, $4.00 in paper copy, $3.00 in microfiche. Report No. EPA-670/9-75-007, June 1975. 39 p. 117 ref. Berg, G. and White, F. D., eds.

Descriptors: *Chlorination, *Effluents, *Waste water, *Water quality, *Viruses, *Water pollution, *Pollutants, *Bibliographies, Sewage.

Annotations and/or abstracts of published papers and books on viruses in waste, renovated, and other waters are contained in this bibliography. The 117 references were selected from the world's scientific literature published since 1972. (Sinha-OEIS)
W76-13095

PROFESSIONAL BIAS AND WATER REUSE,
George Williams Coll., Downers Grove, Ill.
For primary bibliographic entry see Field 5G.
W76-13096

WASTE DISPOSAL IN SEAFOOD PROCESSING: PUBLIC OR PRIVATE,
Georgia Univ., Athens. Inst. of Natural Resources.
R. M. North.
In: Coastal Plains Center for Marine Development Services 'Report of the Conference on Marine Resources of the Coastal Plains States', December 11-12, 1975, Savannah, Ga., p 29-36. 7 ref.

Descriptors: *Fish handling facilities, *Waste treatment, *Economic efficiency, Economic impact, Third party effects, Equity, Water quality, Cost sharing, Coastal plains, Water pollution control, Treatment facilities, Effluents, Standards, Legislation.
Identifiers: *Seafood processing wastes.

The variables involved in decision making by the coastal seafood processing industry with regard to waste disposal and effluent treatment are discussed in relation to the general aspects of benefit and cost distribution between externalities and economic impact, i.e., attaining efficiency in

waste management. Decisions must also be based on the extent of water quality desired, what institutional arrangements are required, and how should the water quality levels adopted be paid for. The stricter federal and state regulations for effluent discharges influence the decision whether to install private treatment facilities or enter into contracts with municipalities; the latter would involve considerations of contractual constraints and the risks of escalating municipal charges; the former would involve escalating construction and operating and maintenance costs and firm's ability to effectively manage the treatment system to avoid penalties or litigation. The dilemma in coastal areas is the question of determining the economically efficient levels of waste treatment to comply with the latest federal water pollution control legislation. The solution lies by the industry and public offices to work out an economically efficient system of seafood waste treatment which fully considers the real demands for water quality, the best institutional arrangements to meet such demands, and the equitable apportionment of costs among the consumers of water quality. (See also W76-09329) (Auen-Wisconsin)
W76-13102

EFFECTS OF CHLORINE AND SULFITE REDUCTION ON LAKE MICHIGAN INVERTEBRATES,
Wisconsin Univ., Milwaukee. Center for Great Lakes Studies.
For primary bibliographic entry see Field 5C.
W76-13113

SEASONAL VARIATIONS IN THE PURIFICATION OF TREATMENT PLANT EFFLUENT IN NATURAL SAND DEPOSITS,
Rensselaer Polytechnic Inst., Troy, N. Y. Fresh Water Inst.
D. B. Aulenbach, N. L. Clesceri, L. Hajas, and S. Beyer.
Report FWI 76-1, January 1976. 41 p. 24 fig., 2 tab., 13 ref. EPA R803452-01, DACA 89-74-1637.

Descriptors: *Seasonal, *Waste Water treatment, *Efficiencies, *Sands, *Tertiary treatment, *New York, Groundwater, Seepage, Infiltration, Hydrogen ion concentration, Chlorides, Dissolved solids, Dissolved oxygen, Nitrogen, Phosphorus, Alkalinity, Coliforms, Biochemical oxygen demand.
Identifiers: *Lake George Village(NY), West Brook(NY), Lake George(NY).

Effluents from the Lake George Village Sewage Treatment Plant, New York, were studied to determine if the final treated effluent quality varied seasonally. A deep natural sand deposit near the lake is used for tertiary treatment. Most of the effluent re-emerged from the ground along with additional groundwater. Flow did not vary during fall and winter, but increased in spring due to increased runoff and infiltration; high summer flows occurred during the tourist season. Flows have increased since 1968 when the sewer district was enlarged. Temperature, alkalinity, pH, chlorides, dissolved solids, dissolved oxygen, nitrogen, nitrates, ammonia, and phosphorus were studied seasonally at the various seepage areas and in West Brook which carries the seepage to Lake George. In West Brook, dissolved oxygen, alkalinity, dissolved solids, and chloride levels were high; nitrogen oxidized to nitrate, and phosphorus was reduced to below natural groundwater levels; and coliforms and biochemical oxygen demand levels were extremely low, so that the water is suitable for drinking. The present system provides adequate treatment, even during seasonal stress. Water quality in Lake George is not being strained. Disposal of sewage effluents onto soil provides the equivalent of tertiary treatment, especially for phosphorus removal, at minimum cost. (Buchanan-Davidson--Wisconsin).
W76-13121

THE ROLE OF DESALTING AND BRACKISH WATER RESOURCES IN THE ARID REGIONS OF THE AMERICAS,
Massachusetts Inst. of Tech., Cambridge. Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 3A.
W76-13133

METHOD AND APPARATUS FOR TREATING LIQUID CONTAMINATED WITH RADIOACTIVE PARTICULATE SOLIDS,
Hydromation Filter Co., Livonia, Mich. (Assignee).
G. Hirs.
U. S. Patent No. 3,962,078, 8 p, 3 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 947, No 2, p 753-754, June 8, 1976.

Descriptors: *Patents, *Waste water treatment, *Radioactive wastes, Water pollution sources, Nuclear wastes, *Radioactive waste disposal, Water pollution treatment, Water pollution control, Filtration, Water reuse, Filters, Screens.
Identifiers: Granular filter bed.

A method and apparatus reduces the amount of radioactive solids resulting from the filtration of particulate contaminants from liquid in a nuclear reactor plant. A filtration system includes a prefilter comprising a sheet filter medium through which the reactor liquid passes to remove relatively large particulate contaminants for storage or disposal. The reactor liquid is then passed through a bed of granular filter medium to accumulate substantially all previously non-filtered contaminants and thereby provide a clarified liquid suitable for reuse in the reactor. Backwash liquid is flowed through the granular filter bed to remove and entrain the accumulated contaminants into a slurry which is received by a reservoir where the slurry is maintained quiescently to settle the contaminants. Removal of liquid from the reservoir concentrates the contaminants for storage or further processing, without the necessity of large quantities of filter aids that would increase the quantity of storage-requiring contaminated solids. (Sinha-OEIS)
W76-13142

SODIUM SULFUR OXIDES WASTES DISPOSAL PROCESS,
Industrial Resources, Inc., Chicago, Ill. (Assignee).
J. M. Dulin, E. C. Rosar, R. B. Bennett, H. S. Rosenberg, and J. M. Genco.
U. S. Patent No. 3,962,080, 13 p, 12 tab, 5 ref; Official Gazette of the United States Patent Office, Vol 947, No 2, p 754, June 8, 1976.

Descriptors: *Patents, *Industrial wastes, *Waste water treatment, *Water pollution treatment, Water pollution control, Water softening, Demineralization, Sludge treatment, Sodium compounds, Electric powerplants, Heat treatment, *Waste disposal.
Identifiers: Sintering, Blow-down sludges.

In preparing water for use as boiler feedwater, makeup water, or in cleaning up condenser water, nuclear reactor coolant water, spent fuel storage water, sump waste water, rad wastes, deborating units, and decontamination units, ambient or recirculating water supplies are decontaminated or demineralized to remove various components. Sodium sulfur oxide compounds are produced as by-products from such industrial processes. Still another source of sodium sulfate is that contained in the blowdown from nuclear or fossil fuel fired power plant cooling towers. This patent describes a process which results in reducing the solubility of waste sodium sulfite and sulfate. Alkali metal sulfur oxide compounds are mixed with fly ash, formed into an agglomerate particle, and sintered at temperatures ranging from 1000 -2300F for a period of time, dependent principally on the specific heat of the mixture. The sintering may take place under oxidizing or slightly reducin conditions, at sub- or super-atmospheric pressure although ambient oxidizing and atmospheric pre sure conditions are preferred. The agglomerat may be a pellet containing a binder, may be sel bound as with water, or may be briquetted unde pressure. The end-product shows reduced solubil ty of the sodium sulfur oxide compounds fixing heavy metal or radioactive components in the as reduced volume and increased density. The part cle is suitable for use as such as an aggregate, e g as mulch or road bed fill, or used as an aggregate a composition such as in concrete, a pozzola asphalt, ceramics (bricks). (Sinha-OEIS)
W76-13143

RAIN STORING TANK,
G. Nussbaum.
U.S. Patent No. 3,962,084, 4 p, 18 fig, 13 ref; Official Gazette of the United States Patent Offic Vol 947, No 2, p 755, June 8, 1976.

Descriptors: *Patents, *Waste water treatmen *Water storage, Water pollution treatmen *Water pollution control, Water quality contro *Storage tanks, *Rainwater, Surface runoff, E cess water, Storm drains, Combined sewer Storm water.

A rainstoring tank of substantially circular desig is inserted in a main sewer which leads to the p rification plant of a combined-water sewer syste The tank is provided with tangentially enterin combined-water channel and a sanitary sewag drain leading from the center of the tank bottom the purification plant. In dry weather the sanita sewage flows from the periphery directly to th central drain. However when it starts raining, th combined water shoots, because of its kinet energy, tangentially into the tank and removes, b rinsing, the polluted sediments from the tank bo tom. The tank capacity stores the first, strong polluted rain water surge and prevents th discharge. Heavier sanitary sewage materials a conveyed, by cyclonic effect, first outward an then, by the superposed toroidal flow, via the tan bottom to the sanitary sewage outlet. While th tank is being increasingly filled up to the relie gate, the flow quiets down and a mechanical p rification takes place, so that during persistin rainfall mechanically purified combined water ca drain. While the tank is being emptied the flo continues to feed the purification plant uniformly and the originating eddy or spiral flow assures sweeping water force sufficient for a thorough cleansing of the tank bottom. (Sinha-OEIS)
W76-13145

IMMERSION FILTER,
H. Hartmann.
U.S. Patent No. 3,962,087, 6 p, 6 fig, 7 ref; Official Gazette of the United States Patent Office, V 947, No 2, p 756, June 8, 1976.

Descriptors: *Patents, *Waste water treatmen Water pollution treatment, *Sewage treatmen Water quality control, *Filtration, Biological trea ment, Submergence, *Filters, Biological mem branes, Oxygen, Equipment.
Identifiers: *Immersion filters.

An immersion percolating filter arrangement fo biologically purifying sewage effluent is provide with growth accumulation surfaces adapted to b slowly rotated so that the surfaces are alternate immersed in the sewage effluent and then remove to enrich the biological growth accumulated on with oxygen. The growth accumulation surface are formed from a flexible material which a suspended under tension in planes parallel to on another within a roller cage support structure ha ing end faces which are substantially circular. Th end faces of the roller cage support structure a each provided with a bearing arrangement for pe mitting the rotation of the support structure abo the axis of rotation with one of the bearing a

gements being connected to a suitable driving rce. The end faces of the roller cage support cture are provided with radial support arms the free ends of the arms being connected by gid connection member extending parallel to axis of rotation for supporting the flexible erial. (Sinha - OEIS)
-13146

DATION PROCESS FOR IMPROVING THE VIRONMENTAL QUALITY OF WATER NTAINING SULFUR AND/OR INORGANIC -SIX-SULFUR-CONTAINING IMPURITIES,
vron Research Co., San Francisco, Calif.
ignee).
Dardenne-Ankringa, Jr.
Patent No. 3,963,611, 7 p, 1 fig, 2 tab, 4 ref; cial Gazette of the United States Patent Of- Vol 947, No 3, p 1262, June 15, 1976.

criptors: *Patents, *Waste water treatment, ustrial wastes, *Water pollution treatment, ter quality control, *Oxidation, Sulfur com- ds, Temperature, Hydrogen ion concentra-

ater stream is improved by oxidizing sulfur or the sulfur content of sub-six-sulfur-con- ng impurities in the stream to sulfate. In the od, the stream is contacted with molecular en under particular conditions which include evated temperature, a substantial oxygen gas al pressure, a pH of at least 9.6 and the sub- ial absence of a heavy metal oxidation yst. For each gram atom of sub-six sulfur, the act mixture must contain at least one valent of a strong inorganic base such as sodi- ydroxide. (Sinha-OEIS)
13150

HOD AND APPARATUS FOR CIPITATING COLLOIDS FROM AQUEOUS ENSIONS,
on Textile Mills, Inc., Ga. (Assignee).
Sullins.
Patent No. 3,964,991, 3 p, 6 fig, 7 ref; Offi- Gazette of the United States Patent Office, 47, No 4, p 1720, June 22, 1976.

riptors: *Patents, *Waste water treatment, strial wastes, *Water pollution treatment, er quality control, Colloids, *Flocculation, rolysis, Cathodes, Anodes, Dyes, Equip- *Skimming.
fiers: Textile industry.

der to effectively cause flocculation of nded colloidal particles, it is necessary to lize the electric charges on the particles and aneously to establish miniscule gaseous bub- which attach themselves to the neutralized es to effect flotation of the particles to the e where they may readily be skimmed off. vention utilizes principles of electrolysis ef- ly by neutralizing the colloidal suspension H of approximately 7. The apparatus is pro- which causes effluent containing colloids to ved along a path which is generally spiral which imparts a churning and efficient ing action to the surfaces of the cathode and This action is achieved by constructing the e in hollow cylindrical form and by con- ng the anode of a multi-valent metal in solid ical form and by mounting the anode inside cylindrical cathode in such a manner as to a path between the cathode and anode is spiral. This controlled movement along ptical path inhibits the accumulation of en and oxygen on the cathode and anode tively. By keeping the particles small, the nent of such small particles to the colloidal es is facilitated. The particles which due to ion of multi-valent cations derived from the are in clusters and are therefore by this floated to the surface and skimmed away ventional means in a flotation cell. (Sinha-

W76-13159

OPTIMAL DESIGN OF CHLORINATION SYSTEMS,
Malviya Regional Engineering Coll., Jaipur (India).
For primary bibliographic entry see Field 5F.
W76-13163

DYNAMIC PROGRAMMING MODEL FOR WASTEWATER PLANT INVESTMENT,
Michigan Univ., Ann Arbor. Dept. of Civil Engineering.
J. M. Armstrong.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, Vol 102, No EE5, p 985-1003, October 1976. 14 fig, 2 tab, 12 ref.

Descriptors: *Sewage treatment, *Treatment facilities, *Waste water(Pollution), *Dynamic programming, *Decision making, *Investment, Planning, Engineering, Water quality, Methodology, Equations, Capital costs, Operating costs, Technology, Systems analysis, Mathematical models.
Identifiers: *Capacity expansion, Cost minimization.

The problem of wastewater treatment plant capacity is examined. A decision model, which utilizes a dynamic programming formulation, is developed which generates optimum plant capacity expansion strategies. The model allows for variation in available treatment technology, capital and operating costs, demand based on different population projections, and changes in construction and labor cost indices. The methodology of the model is readily usable by managers and decision makers interested in exploring short-term or long-term plant expansion programs. Comparison with other research on capacity expansion is made and the model is found consistent with previous theoretical results. (Bell-Cornell)
W76-13164

OPTIMAL DESIGN OF WASTEWATER COLLECTION SYSTEMS,
Roorkee Univ. (India).
J. M. Gupta, S. K. Agarwal, and P. Khanna.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, p 1029-1041, Vol 102, No EE5, October 1976. 7 fig, 3 tab, 13 ref.

Descriptors: *Sewage treatment, *Waste water(Pollution), *Optimization, *Design, Computers, Hydraulic models, Economics, Constraints, Equations, Algorithms, Systems analysis.
Identifiers: *Cost minimization, *Waste water collection, Nonlinear programming, Global optimum.

The most sought-after requirements of an optimization algorithm are with respect to computer time and memory. For the six-link system, the time required for execution of a program is 70 seconds on an IBM-360 (Model No. 44) computer, indicating that the algorithms are fast converging. Further, it takes only 75 seconds to compile and load the program on a disk. The requirement of storage space is also very small. The total memory requirement on this computer is 9E8 bytes. A nonlinear algorithm based on Powell's method of conjugate directions is developed to optimize the design of wastewater collection systems. The algorithm is fast converging, requires small computer memory, employs the discrete set of commercially available diameters, and leads to a global optimum. The economics of optimal and conventional designs is compared for a six-link wastewater collection system at Roorkee, India. Also, a parametric study is presented. (Bell-Cornell)
W76-13165

DESIGNING REGIONALIZED WASTE WATER TREATMENT SYSTEMS,
Ohio State Univ., Columbus. Department of Civil Engineering.
E. E. Whitlatch, Jr, and C. S. ReVelle.
Water Resources Research, Vol. 12, No. 4, p 581-591, August 1976. 13 fig, 1 tab, 22 ref.

Descriptors: *Waste water treatment, *Treatment facilities, *Estuaries, *Optimization, *Economics, *Design, *Water quality control, Regions, Sewage treatment, Rivers, Costs, Piping, Pumping, Dissolved oxygen, Dynamic programming, Linear programming, Equations, Algorithms, Alternative planning, Management, Mathematical models, Systems analysis.
Identifiers: Cost minimization, Heuristic location techniques, *Delaware Estuary.

The problem of determining the optimal number, location, and level of treatment for regional domestic sewage treatment plants along an estuary or river is considered. The formulation is one of minimizing the sum of treatment and transport (piping and pumping) costs such that water quality improvement goals for dissolved oxygen are met. Restrictions may also be placed upon the overall level of treatment (required secondary, required uniform, or least cost) if desired. An optimization procedure is developed which utilizes dynamic programing, linear programing, and heuristic location techniques in a series of steps which lead to progressively improved (lower total cost) solutions. The location procedure is intended for use by an engineer-planner during the design stage and requires his participation and skilled judgment during the course of the algorithm. The technique is illustrated for the Delaware estuary for 22 domestic waste sources, nine potential regional sewage treatment plant sites, and 22 industrial waste sources. Results of the case study show considerable savings over previous nonregional treatment schemes. (Bell-Cornell)
W76-13166

SANITARY LANDFILL STABILIZATION WITH LEACHATE RECYCLE AND RESIDUAL TREATMENT,
Georgia Inst. of Tech., Atlanta. School of Civil Engineering.
For primary bibliographic entry see Field 5E.
W76-13187

CHARACTERISTICS OF BOATS AS SOURCES OF SEA POLLUTION, (IN RUSSIAN),
Scientific Research Inst. of Water Transport Hygiene, Moscow (USSR).
For primary bibliographic entry see Field 5B.
W76-13191

5E. Ultimate Disposal Of Wastes

LAND APPLICATION OF WASTEWATER, (LITERATURE REVIEW),
New York State Dept. of Environmental Conservation, Albany.
For primary bibliographic entry see Field 5D.
W76-12676

INTER-RELATION OF KEY-FACTORS FOR INFILTRATION OF LIQUID DOMESTIC WASTE INTO SOIL,
Connecticut Univ., Storrs.
For primary bibliographic entry see Field 5D.
W76-12679

SLUDGE PROCESSING, TRANSPORTATION AND DISPOSAL/RESOURCE RECOVERY: A PLANNING PERSPECTIVE,
Environmental Protection Agency, Washington, D.C. Div. of Water Planning.
For primary bibliographic entry see Field 5D.
W76-12683

ATLANTIC RICHFIELD HANFORD COMPANY, QUARTERLY REPORT, TECHNOLOGY DEVELOPMENT FOR LONG-TERM MANAGEMENT OF HANFORD HIGH-LEVEL WASTE, JULY 1975 THROUGH SEPTEMBER 1975.
Atlantic Richfield Hanford Co., Richland, Wash. Advanced Waste Engineering Dept.
For primary bibliographic entry see Field 5D.
W76-12684

FEASIBILITY OF MICROBIAL DECOMPOSITION OF ORGANIC WASTES UNDER CONDITIONS IN DEEP WELLS,
Oklahoma State Univ., Stillwater. Dept. of Microbiology.
For primary bibliographic entry see Field 5D.
W76-12688

INTERIM SOLIDIFICATION OF SRP WASTE WITH SILICA, BENTONITE, OR PHOSPHORIC ACID,
Du Pont de Nemours (E.I.) and Co., Aiken, S.C. Savannah River Lab.
For primary bibliographic entry see Field 5D.
W76-12690

CHEMICAL WASTE LAND DISPOSAL FACILITY DEMONSTRATION GRANT APPLICATION.
Barr Engineering Co., Minneapolis, Minn.
For primary bibliographic entry see Field 5D.
W76-12699

OPERATIONS MANUAL ANAEROBIC SLUDGE DIGESTION,
Stevens, Thompson and Runyan, Inc., Portland, Oreg.
For primary bibliographic entry see Field 5D.
W76-12700

ACID DIGESTION OF COMBUSTIBLE WASTES: A STATUS REPORT,
Hanford Engineering Development Lab., Richland, Wash.
For primary bibliographic entry see Field 5D.
W76-12776

A TECHNICAL, ENVIRONMENTAL AND ECONOMIC EVALUATION OF THE 'WET PROCESSING SYSTEM FOR THE RECOVERY AND DISPOSAL OF MUNICIPAL SOLID WASTE'.
Systems Technology Corp., Dayton, Ohio.
For primary bibliographic entry see Field 5D.
W76-12854

REST AREA WASTEWATER TREATMENT AND DISPOSAL,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W76-12855

ECONOMICAL RESIDENTIAL PRESSURE SEWER SYSTEM WITH NO EFFLUENT,
SIECO, Inc., Columbus, Ind.
For primary bibliographic entry see Field 5D.
W76-12861

ENVIRONMENTAL SURVEY OF TWO INTERIM DUMPSITES--MIDDLE ATLANTIC BIGHT.
Environmental Protection Agency, Annapolis, Md. Annapolis Science Center.
For primary bibliographic entry see Field 5B.
W76-12875

AWT ENERGY NEEDS - A PRIME CONCERN,
Orange County Water District, Fountain Valley, Calif. Board of Directors.
For primary bibliographic entry see Field 5D.
W76-12919

MOGDEN, WHERE SEWAGE WORKS,
For primary bibliographic entry see Field 5D.
W76-12923

FATE OF METALS IN WASTEWATER DISCHARGE TO OCEAN,
CDM, Inc., Pasadena, Calif.
For primary bibliographic entry see Field 5B.
W76-12927

FREEZE TREATMENT OF ALUM SLUDGE,
Envirotech Corp., Salt Lake City, Utah. EIMCO BSP Div.
J. H. Wilhelm, and C. E. Silverblatt.
American Water Works Association Journal, Vol. 68, No. 6, p 312-314, June, 1976. 5 fig, 1 tab, 1 ref.

Descriptors: *Sludge treatment, *Freezing, *Sludge, *Dehydration, *Dewatering, Treatment facilities, Drainage, Refrigeration, Operating costs, Landfills.
Identifiers: *Alum sludge, Natural freezing, *Freeze treatment.

Improving sludge characteristics by freeze treatment and application of the method to difficult sludge situations were studied. The sludge particles are dehydrated when the water closely associated with them freezes. After thawing, the particles retain the new sizes and shapes produced by dehydration, and the consequent rapid dewatering properties. The sludge must be frozen completely for a sufficient length of time to dehydrate the particles. Freeze treatment is sometimes followed by thickening and drying steps, but the drainage properties of the treated solids are so good that the treated slurry could be sent directly to a lagoon or drying bed. Natural freezing could be used in cold climates in winter if the sludge is completely frozen and the treated solids can be conveniently harvested after thawing. The refrigeration equipment for freeze treatment is relatively maintenance-free and operates continuously without operator attention. The electric power to operate such a unit often costs the same or less than the pre-treatment chemicals that would be required for other treatment methods. Freeze treatment is effective for any sludge quality. Because no chemical conditioners or additives are used, they cannot leach into ground water when the sludge is used as land fill. The freeze-treated sludge alone can support vegetation. Because this sludge retains its good dewatering and drainage properties indefinitely, it will not become gelatinous and cause drainage problems in a land-fill operation. (Snyder-FIRL)
W76-12928

CHEMICAL AND PLANT EXTRACTABILITY OF METALS AND PLANT GROWTH ON SOILS AMENDED WITH SLUDGE,
Department of Agriculture, Ottawa (Ontario). Soil Research Inst.
For primary bibliographic entry see Field 5B.
W76-12929

SANITARY LANDFILL LEACHATES AND THEIR TREATMENT,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W76-12930

SOLID WASTES AND WATER QUALITY, (LITERATURE REVIEW),
Environmental Protection Agency, Washington, D. C. Wastewater Research Div.
J. A. Heidman, and D. R. Brunner.
Journal Water Pollution Control Federation, Vol. 48, No. 6, p 1299-1305, June, 1976. 40 ref.

Descriptors: *Solid wastes, *Waste dispo
*Water quality, *Landfills, *Leachate, Grou
water, Water pollution, Sludge, Municipal was
Industrial wastes, Waste treatment, De
criteria, Monitoring, Analytical techniqu
Materials, Reviews, *Bibliographies.
Identifiers: *Literature review.

A review of literature dealing with the effec
solid waste disposal on water quality is presen
Topics covered include: factors affecting leach
formation and control, a numerical procedure
evaluating the environmental impact associa
with land disposal, the use of earth resistivity
veys to define groundwater contaminat
techniques for monitoring landfill sites, the che
cal characteristics of two leachate plumes near
landfills, the groundwater quality underlying la
fills in Alaska, the design of a demonstration la
fill in an area with very high groundwater, anal
cal procedures for leachate composition stud
an evaluation of the combined disposal of wa
water sludges and municipal refuse in a sanit
landfill, leachate management alternatives, mat
als used for containing leachates at sanitary la
fill sites, the design of an experimental paper
sludge landfill, and the design and operation o
on-site leachate collection, treatment, and dispo
facility at a landfill site. (Kreager-FIRL)
W76-12933

PRELIMINARY ASSESSMENT OF SYSTE FOR DERIVING LIQUID AND GASEO FUELS FROM WASTE OR GROWN G GANICS,
National Aeronautics and Space Administrati
Cleveland, Ohio. Lewis Research Center.
For primary bibliographic entry see Field 5D.
W76-12967

SEWAGE EFFLUENT TURNED TO SNO PROVIDES STORAGE, REMOVES POLL TANTS,
Wright-McLaughlin Engineers, Denver, Colo.
For primary bibliographic entry see Field 5D.
W76-13048

PRESENT-DAY AND FUTURE PROBLE CONCERNING THE PURIFICATION WATER USED IN RAISING PIGS, FRENCH),
Institutul de Studii, Cercetari si Proiectari Pen
Gospodarirea, Bucharest (Rumania).
For primary bibliographic entry see Field 5D.
W76-13055

WASTE DISPOSAL IN SEAFO PROCESSING: PUBLIC OR PRIVATE,
Georgia Univ., Athens. Inst. of Natu Resources.
For primary bibliographic entry see Field 5D.
W76-13102

METHOD AND APPARATUS FOR TREATI LIQUID CONTAMINATED WITH RADIOA TIVE PARTICULATE SOLIDS,
Hydromation Filter Co., Livonia, Mi (Assignee).
For primary bibliographic entry see Field 5D.
W76-13142

SODIUM SULFUR OXIDES WASTES DISPOS PROCESS,
Industrial Resources, Inc., Chicago, (Assignee).
For primary bibliographic entry see Field 5D.
W76-13143

UNIVERSITY OF ILLINOIS URBANA-CHAMPAIGN

NITARY LANDFILL STABILIZATION WITH ACHATE RECYCLE AND RESIDUAL EATMENT,
rgia Inst. of Tech., Atlanta. School of Civil ineering.
. Pohland.
ilable from the National Technical Informa- Service, Springfield, VA 22161 as PB-248 524, 0 in paper copy, $3.00 in microfiche. Report EPA-600/2-75-043, October 1975. 105 p, 31 fig, ab, 46 ref. EPA R-801397.

criptors: *Waste disposal, *Landfills, *Sludge osal, Waste treatment, Aerobic treatment, erobic digestion, Leachate, Leaching, Wastes, d wastes, Activated carbon, Hydrogen ion centration, Organic wastes.
tifiers: *Leachate recirculation, Leachate ment, Landfill stabilization.

lts of an experimental system for study of fill disposal of approximately 0.3 cu m (10 cu f domestic refuse were provided. The study uated not only traditional landfill decomposi- as represented by single pass of water nating from rainfall but also recirculation of collected leachate. Sewage sludge addition to olid waste and pH control of the recirculated ate were also evaluated. Biological and physi- hemical methods for treatment of leachates, cially those derived from the stabilized solid e undergoing leachate recirculation, were also uated. Analysis of about 3 years of data in- ed that leachate recirculation was very ficial in accelerating the removal of at least eadily available organics from the refuse and ate. This rate of removal, accomplished over iod of months for the recirculated units as pared to the traditional, single pass unit, was er enhanced by the initial addition of sewage e and by pH control. The leachate treatment es indicated that either aerobic or anaerobic gical processes successfully remove leachate ics and that the effluent residuals could be ed by activated carbon adsorption and/or ion nge either separately or in combination. -ISWS)
13187

Water Treatment and uality Alteration

POTHESIS OF ION FILTRATION IN A BLE-WATER AQUIFER SYSTEM,
gical Survey, Austin, Tex.
imary bibliographic entry see Field 4B.
2803

MATION OF WATER SUPPLY SYSTEMS,
h Environmental Services, Inc., South Ind.
Echelberger, Jr, B. P. J. Higgins, M. W. y, and D. C. Withey.
ble from the National Technical Informa- ervice, Springfield, VA 22161, as AD-A-008 10.00 in paper copy, $3.00 in microfiche. Construction Engineering Research Labora- Champaign, Illinois, Technical Report E-54, 1975. 340 p, 91 fig, 168 ref, 6 append. Army 23-71-0020.

ptors: *Automatic control, *Water treat- *Water supply, Water quality, Filtration, ation, Flocculation, Sedimentation, Water ng, Iron, Manganese, Taste, Odor, Sludge l, Disinfection, Automation, Equipment, l, Treatment, Reviews.

port provided an engineering evaluation of abilities of various commercially available uality sensing devices and automated con- stems adapted to water treatment plant on. This state-of-the-art survey was accom- through a review of technical journals; nications with experienced consulting engineers, regulatory agency personnel, and treatment plant superintendents; and on-site observations of equipment operation. (Sims-ISWS)
W76-12817

A VIRUS-IN-WATER STUDY OF FINISHED WATER FROM SIX COMMUNITIES,
Health Effects Research Lab., Cincinnati, Ohio. Water Quality Div.
For primary bibliographic entry see Field 5A.
W76-12866

THE ENVIRONMENTAL IMPACT OF WATER CHLORINATION.
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 5C.
W76-12876

CURRENT CHLORINATION AND DECHLORINATION PRACTICES IN THE TREATMENT OF POTABLE WATER, WASTE-WATER, AND COOLING WATER,
For primary bibliographic entry see Field 5D.
W76-12877

CHLORINATION OF ORGANICS IN DRINKING WATER,
Municipal Environmental Research Lab., Cincinnati, Ohio. Water Supply Research Div.
For primary bibliographic entry see Field 5C.
W76-12881

THE POTENTIAL FOR INCREASED MUTAGENIC RISK TO THE HUMAN POPULATION DUE TO THE PRODUCTS OF WATER CHLORINATION,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 5C.
W76-12887

THE EPIDEMIOLOGIC APPROACH TO THE EVALUATION OF WATER-BORNE CARCINOGENS,
National Cancer Inst., Bethesda, Md.
For primary bibliographic entry see Field 5C.
W76-12888

MICROBIOLOGY - DETECTION, OCCURRENCE, AND REMOVAL OF VIRUSES, (LITERATURE REVIEW),
Environmental Research Center, Cincinnati, Ohio.
For primary bibliographic entry see Field 5A.
W76-12896

STUDY ON THE EFFICIENCY OF FOUR PROCEDURES FOR ENUMERATING COLIFORMS IN WATER,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5A.
W76-12897

HYGIENIC EVALUATION OF THE QUALITY OF WATER DESALINATED IN INDUSTRIAL ELECTRODIALYSIS INSTALLATIONS UNDER CONDITIONS OF COUNTRY SETTLEMENTS, (IN RUSSIAN),
Meditsinskii Institut Saratov (USSR).
E. V. Shtannikov, A. M. Akimov, G. I. Rozhnov, and A. A. Orlov.
Gig Sanit. 38(1), p 23-27, 1973.

Descriptors: Public health, *Desalination, Water quality standards, *Potable water, *Electrodialysis, *Water treatment.

Water desalinated in industrial electrodialysis installations satisfied hygienic requirements for drinking water quality. The desalinated water left no unpleasant taste after its use and was assessed as adequate for human domestic and drinking purposes.–Copyright 1975, Biological Abstracts, Inc.
W76-12910

DISINFECTION, (LITERATURE REVIEW),
Georgia Inst. of Tech. Atlanta. School of Civil Engineering.
A. W. Hoadley, and J. Gould.
Journal Water Pollution Control Federation, Vol. 48, No. 6, p 1166-1170, June, 1976. 45 ref.

Descriptors: *Disinfection, *Potable water, *Waste water treatment, *Water purification, Chlorination, Ozone, Ultraviolet radiation, Bacteria, Viruses, Organic compounds, Chlorine, Coliforms, Enzymes, Analytical techniques, Aerobic treatment, Reviews, *Bibliographies, *Water treatment.
Identifiers: *Literative reviews.

A literature survey of papers dealing with the disinfection of water is presented. Specific topics discussed include: methods for the measurement of residual chlorine, the formation of chlorinated organic compounds in chlorinated drinking water and waste water, the effect of chlorine on the enzymes of Escherichia coli, the combined effect of ozone and sonication on the inactivation of pathogenic and non-pathogenic bacteria in secondary waste water effluent, reduction in bacterial count during thermophilic aerobic digestion, the effectiveness of glutaraldehyde for virus deactivation, the use of ultraviolet light for virus deactivation, and procedures for testing and comparing different disinfectants. (Kreager-FIRL)
W76-12924

PHOSPHORUS REDUCTION WITH BIVALENT IRON SULFATE AT THE KAPPALA WATER PURIFICATION PLANT, (IN SWEDISH)
Kappalaverket, Lidingo (Sweden).
For primary bibliographic entry see Field 5D.
W76-12989

VIRUSES IN WASTE, RENOVATED, AND OTHER WATERS. 1974 LITERATURE ABSTRACTS,
National Environmental Research Center, Cincinnati, Ohio.
For primary bibliographic entry see Field 5D.
W76-13095

APPARATUS FOR SOFTENING HARD WATER,
Maruyama Mfg. Co. Ltd., Tokyo (Japan). (Assignee).
Y. Fulukawa.
U.S. Patent No. 3,962,089, 7 p, 22 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 947, No 2, p 757-758, June 8, 1976.

Descriptors: *Patents, *Water treatment, *Water purification, *Water softening, Water quality, Demineralization, Hardness(Water), Ion exchange, Resins, Equipment, Valves.

An apparatus for softening hard water is described. A raw water pipe, a soft water pipe, a discharge pipe and a salt water pipe are connected with a cylindrical valve seat equipped on a softening tank accommodating a layer of ion-exchange resin. A rotary valve is installed in the cylindrical valve seat and is provided with a passage through which the raw water pipe, soft water pipe and discharge pipe can be separately connected with a water pipe erected through the ion-exchange resin layer. Through rotation of the rotary valve, the combinations of (1) a raw water pipe and soft water pipe, (2) raw water pipe and discharge pipe and (3) walt water pipe and discharge pipe can be alternately connected with the softening tank. A controlling circuit is provided with a floating switch installed in the softening tank, so that when the water level in the softening tank descends

below a predetermined level the switch works to rotate the motor and automatically displace the rotary valve from the position for stopping the operation to the position for softening, and as a result, there is no fear of overflow of the softening tank to be caused by excessive supply of soft water, and a fixed amount of soft water necessary for the operation can be always secured. (Sinha-OEIS)
W76-13147

SEPARATOR,
Daicel, Ltd., Tokyo (Japan). (Assignee).
K. Ishii, and T. Kubo.
U.S. Patent No. 3,962,096, 4 p, 3 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 947, No 2, p 759-760, June 8, 1976.

Descriptors: *Patents, *Water purification, *Water treatment, *Water pollution treatment, Water pollution control, Semipermeable membranes, *Reverse osmosis, Membrane processes, *Separation techniques.

An apparatus for separating solutes from water by a reverse osmosis process is described. A separating element is constructed by forming two layers of a semipermeable film into an envelope. A lining capable of allowing the passage of the permeated liquid and also sufficiently rigid to support the inner surfaces of the film layers when the cleaning member is pressed against the outer surfaces is inserted between the two layers of the envelope. One end of the envelope is connected with a collecting pipe having small bores to collect the water which has passed through the semipermeable film into the internal compartment of the envelope containing the lining. The periphery of the envelope is tightly sealed. A corrugated spacer is placed on the envelope and the spacer and envelope are wound in a spiral fashion around the collecting pipe. The ridges and grooves of the spacer define channels which extend parallel to the longitudinal axis of the collecting pipe. The opposite edges of the spacer have notches to provide communication between adjacent channels so that the water to be treated, as well as objects for cleaning the film, can move from one channel to the next in series. The tubular separating element or cartridge thus obtained is placed in a pressure vessel. (Sinha-OEIS)
W76-13148

SYSTEM OF WATER PURIFICATION AND PRODUCT DISTRIBUTION,
C. W. Gossett, and W. J. Dauenhauer.
U. S. Patent No. 3,963,612, 4 p, 7 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 947, No 3, p 1262, June 15, 1976.

Descriptors: *Patents, *Water purification, *Water treatment, *Reverse osmosis, *Domestic water, Hydraulic properties, Reservoirs.

A system of water purification and distribution employs a movable mounted reverse osmosis module that moves in response to the hydraulic pressure differential created on opposite sides of it during the operation of the system. It is especially devised for home use. A vessel having a relatively large interior chamber for housing the principal components has an inlet connected with a conventional water service line as well as an outlet for discharging nearly pure product water. A stationary upright cylinder secured to the bottom of the vessel and a reciprocable reverse osmosis module are within the chamber. The hydraulic differential pressure on the opposite sides of the chamber controls the supply of raw water from the water service line. A cup reservoir connected to the outlet of the reverse osmosis module holds a replenishable supply of nearly pure product water and is connected to a valve-controlled water distribution line. (Sinha - OEIS)
W76-13151

NOVEL POLYMER MEMBRANES FOR REVERSE OSMOSIS,
Babcock and Wilcox ltd., London (England). (Assignee).
W. M. Muir.
U. S. Patent No. 3,963,618, 8 p, 6 ref; Official Gazette of the United States Patent Office, Vol 947, No 3, p 1264, June 15, 1976.

Descriptors: *Patents, *Water purification, *Membranes, *Reverse osmosis, Osmosis, Membrane processes, Organic compounds, Filtration, Separation techniques, Resins.
Identifiers: Polyvinyl co-acetal resin, Ultra-filtration.

A series of organic polymers are described which, when cast in the form of membranes, are useful in the fields of osmosis, reverse osmosis, ultra-filtration and related techniques. In different aspects the invention includes the new polymers and methods of making them, membranes incorporating the polymers and methods for making them, apparatus utilising the new membranes for liquid purification and separation, and methods of so treating liquids. In general as thin a membrane as possible is produced which still has sufficient mechanical strength to be usable. Further variations can be made in the casting technique to vary the structures of the membranes. Membranes produced by the methods of this invention can be incorporated into standard modules or appartus for water purification. Osmotic pressure can be very high and so for reverse osmosis applications and hyperfiltration under pressure, the membrane needs to be supported on a rigid porous matrix. (Sinha-OEIS)
W76-13153

APPARATUS FOR THE PREVENTION OF SCALING IN DESALINATION APPARATUS,
Commissariat a l'Energie Atomique, Paris (France); and Compagnie des Salins du Midi et des Salines de l'Est, Paris (France). (Assignee).
For primary bibliographic entry see Field 3A.
W76-13154

PRESENCE OF INSECTICIDES IN SURFACE WATERS AFTER CONDITIONING TREATMENT, (IN ITALIAN),
Camerino Univ. (Italy). Istituto di Igiene.
M. G. Pellegrini, and M. Cocchioni.
Boll Soc Ital Biol Sper. 50(15), p 1138-1142, 1974(1975).

Descriptors: *Water pollution sources, Italy, *Artificial lakes, Lakes, *Surface waters, *Insecticides, *Flocculation, *Water pollution treatment, *Water purification, Filtration, Chlorination, Potable water, Analytical techniques, Gas chromatography, DDD, DDE, DDT, Dieldrin.

Surface waters from a man-made lake in the district of Marche, Italy, are purified by flocculation with aluminum sulfate, filtration and chlorination, resulting in almost total bacterial removal, efficiently reducing organic material and generating potable water. Gas chromatography was used to determine Lindane, Heptachlor epoxide, p,p'-DDE, Dieldrin, p,p'-DDD and p,p'-DDT in the waters before and after passage through the purification plants. The insecticides increased in the raw river water in July and Oct. (probably because increased rainfall washed insecticide from the soil). The purification plant reduced insecticides considerably particularly when the water was most turbid. Typical figures in micrograms per liter are DDT 0.042 and 0.10; Dieldrin 0.0197 and 0.117; Lindane 0.0138 and 0.0050.--Copyright 1976, Biological Abstracts, Inc.
W76-13160

DETERMINATION OF SODIUM FORM WATE SOFTENER BREAKTHROUGH,
Beckman Instruments, Inc., Fullerton, Cal (Assignee).
D. M. Chisdes.
U.S. Patent No. 3,964,999, 4 p, 2 fig, 6 ref; Offici Gazette of the United States Patent Office, V 947, No 4, p 1723, June 22, 1976.

Descriptors: *Patents, *Water quality contr *Water treatment, *Water purification, Water so tening, Demineralization, Ion exchange, Har ness(Water), Conductivity, Reverse osmos *Ions, *Pollutant identification.
Identifiers: Divalent ions, Monovalent ions, So um ions.

In water softening, utilizing the zeolite or i exchange process, divalent or hardness, calciu and magnesium ions are replaced by monoval ions. In the case of a sodium form water softe the hardness ions are replaced by sodium io This leaves a product water or outflow from t water softener that has a very slight conductiv difference from the hard water feed. The inventi provides a system for detecting exhaustion of water softener and controlling the regenerati which does not depend upon a high degree of s sitivity in the measurement of product conducti ty. The softened water product or outflow is s jected to means for discriminating betwe monovalent and divalent ions. This is done by d ferentially rejecting monovalent and divalent io from the product water by means of a reverse mosis unit. Conductivity is measured both bef and after the product has flowed through t reverse osmosis unit and the two conductiviti are compared. When the water softener b become exhausted the difference between the t conductivities becomes much greater. (Sinh OEIS)
W76-13161

OPTIMAL DESIGN OF CHLORINATIO SYSTEMS,
Malviya Regional Engineering Coll., Jaip (India).
M. L. Tikhe.
Journal of the Environmental Engineering Di sion, Proceedings of the American Society of Ci Engineers, Vol 102, No EE5, p 1019-1028, Octob 1976. 7 fig, 1 tab, 12 ref.

Descriptors: *Water pollution control, *Wa water(Pollution), *Mathematical mode *Chlorination, Environmental engineering, O timization, Costs, Organic compounds, Tim Economics, Equations, Systems analysis.
Identifiers: *Chlorine compounds, Contacti *Cost minimization.

A mathematical model has been developed to c culate the chlorine dose required for a desired p centage kill of organisms while keeping the to cost of the process at minimum. The mo developed is general and applicable for water well as wastewater. An example has been work out to illustrate the use of equations proposed. T optimum chlorine dose is not only a function various constants and cost of chlorine but also t volume to be treated. The optimal cost of chlorin tion increases with the increase in percentage k of organisms. (Bell-Cornell)
W76-13163

5G. Water Quality Control

A NON-LINEAR PROGRAMMING MODEL FO EVALUATING WATER SUPPLY POLICIES THE TEXAS COASTAL ZONE,
Texas Univ. at Austin.
For primary bibliographic entry see Field 6D.
W76-12680

EVALUATION OF TWO HYDROGRAPH PARATION METHODS OF POTENTIAL USE REGIONAL WATER QUALITY ASSESS-ENT,
k Ridge National Lab.,Tenn.
D. Huff, and C. L. Begovich.
ailable from the National Technical Informa- Service, Springfield, VA 22161, as NL/TM-5258, $5.50 in paper copy, $3.00 in crofiche. Report ORNL/TM-5258, March 1976, p, 9 fig, 6 tab, 4 ref, 3 append. W-7405-eng-26.

scriptors: Hydrology, *Model studies, drologic data, *Separation techniques, *Water lity, *Hydrographs, *Water quality standards, gions.

e of the hydrograph separation methods which evaluated was the quick-flow method eloped at Coweeta Hydrologic Laboratory. s method assumes that quick flow may be arated from delayed flow by a straight line of trary slope. The second method uses rainfall to define storm events and then separates nflow from baseflow by projecting a baseflow ession curve during the storm event. The two hods were evaluated on their conceptual basis, e of application, cost of data processing, and eptability of results. On the basis of this luation, the quick flow method was favored for in regional assessment. (Chilton-ORNL)
5-12691

DY OF FEDERAL WATER QUALITY NITORING EFFICIENCY,
iro Control, Inc., Rockville, Md.
lershaft.
ilable from the National Technical Informa- Service, Springfield, VA 22161 as PB-246 221, 5 in paper copy, $3.00 in microfiche. Report to ncil on Environmental Quality, Washington, March 1975. 150 p, 2 fig, 7 tab, 22 ref, ap-l. EQ4AC014.

criptors: *Water quality standards, nitoring, *Reviews, Efficiencies, *Pollutant tification, Water pollution control.

study seeks to improve the effectiveness and iency of water quality monitoring through a al review and analysis of pertinent Federal ies and practices. The overview includes re- on the nature and objectives of monitoring, collection requirements, and processing and mination requirements and makes recommen-ns in these areas. These recommendations in- improved record keeping, evaluations of rams on the basis of cost effectiveness, incor-ion of adequate analytical quality control edures, biological monitoring and bottom nents analysis, use of remote sensing niques, and cataloging of all water quality toring activities. (Chilton-ORNL)
12697

ELOPMENT OF A STUDY PLAN FOR NITION OF PCBS USAGE, WASTES, AND NTIAL SUBSTITUTION IN THE INVEST-T CASTING INDUSTRY,
r, Inc., Springfield, Va.
Barden, and R. L. Durfee.
able from the National Technical Informa-ervice, Springfield, VA 22161 as PB-251 842, in paper copy, $3.00 in microfiche. Report 560/6-76-007, January 1976, 35 p, 3 fig, 7 ref. No. 68-01-3259.

iptors: *Polychlorinated biphenyls, city, Toxins, Alternative planning, Wastes. fiers: *Polychlorinated terphenyls.

inal report of a study plan designed to define sage of polychlorinated biphenyls and nyls (PCT) reviews the current knowledge resents methods of information gathering ta sources. Filler substitutes and the use of unfilled waxes are suggested as two general alternatives to deca-chlorobiphenyl and PCTs. There appear to be no technical barriers to discontinuation of deka and PCTs as fillers but the use of alternatives may increase product cost on the order of 10%. An approach to comparison of alternatives based on technical factors and toxicology data is presented. (Chilton-ORNL)
W76-12713

TRITIUM EFFLUENT CONTROL PROJECT, PROGRESS REPORT: OCTOBER - DECEMBER 1974,
Mound Lab., Miamisburg, Ohio.
C. J. Kershner.
MLM-2217, August 1975, 23 p, 3 tab, 6 fig, 21 ref. E-33-1-GEN-53.

Descriptors: Reviews, *Tritium, *Control systems, Effluents, *Waste treatment, Pollution abatement, Treatment facilities.

A progress report is presented for the tritium emission control effort initiated at Mound Laboratory in 1972. The installation of a pilot scale cryogenic adsorbate separation system is reported to have progressed beyond 50% completion. Hydrogen gettering is being investigated and it was found that HIP alloy sorption capacity at room temperature was 2.2 wt. %. HIP alloy preferentially sorbs hydrogen in the presence of air. The possibilities of tritium decontamination by molecular excitation were investigated. Selective photodissociation of HTO in the presence of hydrogen was the best scheme for tritium removal. Three additional organic materials, dimethylformamide, dimethylacetamide, and ethoxyethylacetate, were evaluated for use in an extractive distillation system. A computer program has been developed for calculating operating and design parameters for catalytic exchange enrichment and stripping of tritiated water. (Chilton-ORNL(
W76-12781

TRITIUM EFFLUENT CONTROL PROJECT, PROGRESS REPORT: APRIL - JUNE 1975,
Mound Lab., Miamisburg, Ohio.
C. J. Kershner, and J. C. Bixel.
MLM - 2270, November 1975, 13 p, 1 fig, 6 ref. E-33-1-GEN-53.

Descriptors: Reviews, *Control systems, *Tritium, Effluents, Liquid wastes, *Waste treatment, Treatment facilities, Equipment, Pollution abatement.

The original Tritium Effluent Control Project initiated in 1972, which was directed to gaseous emissions, has expanded to include liquid tritium wastes. Presently the major development effort is in this area. The major effort in the quarter reported upon here has been directed toward procurement of the equipment needed to perform feasibility experiments on water detritiation. Fabrication of an experimental catalytic water detritiation system was completed by Engelhard Minerals and Chemicals Corporation and will be installed at Mound Laboratory. (Chilton-ORNL)
W76-12782

TORTUGUERO BAY ENVIRONMENTAL STUDIES,
Puerto Rico Nuclear Center, Mayaguez.
For primary bibliographic entry see Field 6G.
W76-12783

ECONOMIC EVALUATION OF THE PROMULGATED INTERIM PRIMARY DRINKING WATER REGULATIONS,
Energy Resources Co., Inc., Cambridge, Mass.
J. E. Alpert, and D. Harrington.
Available from the National Technical Information Service, Springfield VA 22161 as PB-248 588, $9.25 in paper copy, $3.00 in microfiche. Report No. EPA-570/9-75-003, October 1975. 276 p, 4 fig, 70 tab, 73 ref, 8 append. EPA No. 68-01-2865.

Descriptors: Evaluation, *Water treatment, *Costs, *Economics, Unit costs, Potable water, Monitoring, *Regulation, Water costs, Water supply, Annual costs, Cost comparisons, Cost analysis, Municipal water, *Water quality standards.
Identifiers: *Drinking water regulations.

An evaluation was performed of the Promulgated Interim Primary Drinking Water Regulations. The results of this study indicated the following: The annual costs for water monitoring for community systems will be between $12 million and $25 million, while the costs for water monitoring for non-community systems will be between $4.5 million and $9.5 million. Between $1.1 billion and $1.8 billion will be required to build additional treatment facilities for removing contaminants from the nation's drinking waters. It will cost $263 million per year for operation and maintenance of these required facilities. The annual per capita costs for those systems which will require treatment range from $240 for a system serving 25 people and treating for heavy metal removal to under $0.25 per year for systems serving over 100,000 people requiring disinfection. A constraint analysis examined the broad area of chemicals and supplies, manpower, laboratories, and engineering and construction services. (Humphreys-ISWS)
W76-12821

ECONOMIC EVALUATION OF THE PROPOSED INTERIM PRIMARY DRINKING WATER REGULATIONS,
Energy Resources Co., Inc., Cambridge, Mass.
J. E. Alpert.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-248 587, $11.00 in paper copy, $3.00 in microfiche. Report No. EPA-570/9-75-002, October 1975. 397 p, 12 fig, 140 tab, 72 ref. 11 append. EPA No. 68-01-2865.

Descriptors: *Evaluation, *Water treatment, *Costs, *Economics, Unit costs, Potable water, Monitoring, *Regulation, Water costs, Water supply, Annual costs, Cost comparisons, Cost analysis, Municipal water, *Water quality standards
Identifiers: *Drinking water regulations.

An economic evaluation was performed of the Proposed Interim Primary Drinking Water Regulations as published in the March 14, 1975, Federal Register. The results of this study indicated the following: The annual costs for water monitoring for community system would be between $22 and $43 million, while the costs for water monitoring for non-community systems would be between $47 million and $92 million if the proposed regulations were adopted. A cost of between $1.1 billion and $1.8 billion would be required to build treatment facilities to remove contaminants from the nation's drinking waters. It would cost an additional $282 million per year to operate and maintain the required treatment plants. The annual per capita costs for those systems which would require treatment would range from $244 for a system serving 25 people and treating for heavy metal removal to $0.25 per year for systems serving over 100,000 people requiring disinfection. A constraint analysis examined the broad areas of chemicals and supplies, manpower, laboratories, and engineering and construction services. (Humphreys-ISWS)
W76-12822

URBAN RUNOFF POLLUTION CONTROL PROGRAM OVERVIEW: FY'76,
Municipal Environmental Research Lab., Edison, N. J. Storm and Combined Sewer Section.
R. Field, A. N. Tafuri, and H. Masters.
Report EPA-600/2-76-095, March, 1976. 67 p, 15 fig, 11 tab.

Descriptors: *Waste water treatment, *Waste treatment, *Sewage treatment, *Runoff, *Waste water(Pollution), Water pollution control, Sewage, Water quality, Hydrology, Combined sewers.

The basic technical and administrative problems associated with urban runoff and the approach of the Environmental Protection Agency's (EPA) research and development program to combat these problems are reviewed. Information on flood control, erosion control and the basic pollutional problems created by wet weather flows is presented. Nationwide cost requirements for abating urban runoff pollution and available abatement technology are discussed. Of overlying importance, program direction and desired goals are cited with intent towards a truer concept of solution methodology involving receiving stream impact analyses. Details of technologic advancements resulting from some 150 research and development projects are summarized. Both nonstructural and structural control are included. The problem is divided into the categories of problem definition, user assistance tools, land management, collection system control, storage, treatment, sludge/solids, integrated systems, and technical assistance/technology transfer. General cost comparisons are made for urban runoff pollution control/treatment. A cost-effective solution for urban runoff pollution control by in-line storage in Seattle, Washington, and a simplified hypothetical plan for wet-weather flow pollution abatement for the Des Moines, Iowa, area are given. (Snyder-FIRL)
W76-12857

APOLLO COUNTY PARK WASTEWATER RECLAMATION PROJECT. ANTELOPE VALLEY, CALIFORNIA,
Los Angeles County Engineer Dept., Los Angeles, Calif.
For primary bibliographic entry see Field 5D.
W76-12864

TIOGA RIVER MINE DRAINAGE ABATEMENT PROJECT,
Pennsylvania Dept. of Environmental Resources, Harrisburg.
A. F. Miorin, R. S. Klingensmith, and R. E. Heizer.
Report EPA-600/2-76-106, June, 1976. 71 p, 18 fig, 15 tab, 3 ref.

Descriptors: *Watersheds(Basins), *Drainage, *Mining, *Coal mines, *Strip mines, *Mine drainage, Mine acids, Pollution abatement, *Pennsylvania, Land reclamation.
Identifiers: *Tioga County(Penn), *Surface mine reclamation.

A mine drainage abatement demonstration project for a mined area in the vicinity of Morris Run Village in Tioga County, Pennsylvania was determined to be feasible. The primary objective of the project is to demonstrate the effectiveness of various preventive measures in eliminating or reducing acid mine drainage discharges. The recommended project includes demonstrating effective techniques for mine drainage abatement, reducing a specific mine drainage problem, and restoring portions of a mined area to their approximate original surface grade. The project calls for the restoration of two strip mines; agricultural limestone will be used to establish vegetation in one and sewage sludge to establish vegetation in the other. The mine to be restored using sewage sludge covers 60 acres. Spoil piles will be used for fill. The site will be restored to its original grade, and holding or infiltration ditches will be constructed immediately downhill from the test plot. Three inches of sewage sludge will be placed on a 4.3-acre test plot and scarified into the top cover. The appropriate amount of grass seed will then be placed on the test plot. It is estimated that implementation of the project will result in a reduction of 8,480 lbs per day of acid under average groundwater conditions. Significant reductions in high flows and loadings are expected from mine drainage discharges during and immediately after precipitation. It is estimated that preventing the runoff from a one-inch 24-hour rainfall from entering the interconnected deep mines will result in a reduction of 63,200 lbs of acid. These reductions should cause an improvement in river water quality. (Snyder-FIRL)
W76-12874

HOW TO DESIGN AERATED LAGOON SYSTEMS TO MEET 1977 EFFLUENT STANDARDS - EVALUATION OF KINETIC COEFFICIENTS,
Clemson Univ., S.C. Dept. of Environmental Systems Engineering.
For primary bibliographic entry see Field 5D.
W76-12903

EXAMPLE FOR REGIONAL PLANNING OF WATER QUALITY IN DENMARK (BEISPIEL EINER REGIONALEN PLANUNG DER GEWAESSERQUALITAET IN DAENEMARK),
G. Posselt.
Forum Umwelt Hygiene, Vol. 27, No. 5, p 160-164, 1976. 1 fig, 2 tab, 6 ref.

Descriptors: *Planning, *Water quality, Europe, Streams, *Watersheds(Basins), Sewerage, Human population, Water demand, Evaluation, Costs, *Regional analysis, Regions.
Identifiers: *Saprobic levels, *Denmark.

A simple scheme for water quality planning in a given region of Denmark uses the classes of the saprobic system. An analysis of the fundamental physical factors for water quality in nearby areas at streams of the region's drainage basins is the plan's basis. This analysis determines the best possible saprobic level after eliminating all known sewage discharges in the area. The next step is a statement of human demands regarding activities at or near watercourses. Dialogue with local associations, municipal organizations, and others interested in sufficient water supplies is necessary. The temporary water quality goal can be defined by comparison of the basic saprobic level, expressing the physical influence of the surroundings, with that level of saprobity which is assumed to assure the various needs of the population. The necessary measures are then drafted. The plan's feasibility is then determined by evaluating the probable costs. (Snyder-FIRL)
W76-12918

ADMINISTRATION - SYSTEMS ANALYSIS, (LITERATURE REVIEW),
Cornell Univ., Ithaca, N. Y. Dept. of Environmental Engineering.
D. P. Loucks, and J. M. Bell.
Journal Water Pollution Control Federation, Vol. 48, No. 6, p 1639-1648, June, 1976. 72 ref.

Descriptors: *Water management(Applied), *Planning, *Administration, *Water quality, Land use, Waste water treatment, Waste water disposal, Model studies, Sewers, Simulation analysis, Treatment facilities, Water reuse, Optimization, Economics, Monitoring, Sampling, Data collections, Reviews, *Bibliographies.
Identifiers: *Literature reviews.

A literature review of the administration of water quality planning and analysis is presented. General topics covered include: comprehensive planning and reviews, land use effects and management, sewer design, waste water treatment systems, waste water disposal on land, waste water reuse, water quality modeling, thermal pollution, monitoring and sampling, and data management. Specific subjects discussed under the above general headings include: methodology for integrating water quantity and water quality management, a method for forecasting the pollution resulting from urban growth, control strategy f minimizing water pollution in receiving wa caused by overflows in combined sewer systen a dynamic programming model for planning the l ture expansion and operation of a waste wa treatment plant, the development of a soil lo land-water allocation optimization model, simu tion studies of the reuse of municipal waste wa for water supply augmentation, modeling stud of the effects of variable waste generation a streamflows on water quality, evaluations of de reservoir models for temperature prediction lakes, system behavior and cost models for fluent sampling programs, and methods generating information needed for the design cost effective water quality control progra (Kreager-FIRL)
W76-12926

ODOR CONTROL WITH HYDROGEN PERO IDE,
Pennsylvania State Univ., Middletown. Dept. Engineering.
For primary bibliographic entry see Field 5D.
W76-12932

ESTIMATES OF SOCIO-ECONOM DAMAGES OF AN OIL SPILL,
Institute for Water and Air Pollution Resear Stockholm (Sweden).
I. Rosenblum, and A. Jernelov.
IVL (Institutet for Vatten- och Luftva sforskning) Publication No. B 264, Decem 1975. 23 p. 5 tab., 3 ref.

Descriptors: *Oil spills, *Social impa *Economic impact, Damages, Fisheries, Oil po tion.
Identifiers: Guatemala, *Caribbean Sea, Livi ston(Guatemala).

The impact of an oil spill in the Caribbean Sea the Guatemala coast on April 1975 was evalua as to the probable duration of its effects and an sessment of the economic losses involved. The sidents of the town of Livingston and along coast up to the border of Belice at Sarstun Riv British Honduras, were interviewed to determ the importance of the fishery to the local popu tion; the extent and type of damage, and economic and social implications. The invent of damages included direct damages in finan losses borne by the fishermen due to disruption their fishing avtivities, reduced catch, equipm damages. Indirect damages were cost due to fish consumption of the fishermen and their pendents; and lost income of the petty fish tra An additional decrease in the catch, although te porary, may result in an accelerating abandonm of fishing which may cause further improveri ment, increased migration to already overpo lated urban areas offering little employment; an further disruption of the society. The bulk of damage constitued financial losses to 43% of population in the communities due to the interr tion of the fishing activities for an average of days and reduced catch for 75 days after the spill occurred. (Auen-Wisconsin).
W76-12947

DOES WATER USE RESTRICT THE LOC TION OF INDUSTRIAL AIR POLLUTERS,
Argonne National Lab., Ill.
D. Santini.
Water, Air, and Soil Pollution, Vol. 5, No. 2, 185-194, 1975. 1 fig., 5 tab., 6 ref. NSF(RANN) A 352 and GI 32989 A2.

Descriptors: *City planning, *Water utilizati *Sites, *Industries, *Air pollution, Pollut abatement, Illinois, Labor supply, Water supply
Identifiers: Industrial clustering.

Water use in industrial production is responsi for much of the urban clustering and consequ

llution. An added impetus toward urban in-
al concentration is the availability of a labor
y. In Illinois most particulate and sulfur
emissions are generated by industries wich
nore than 5 billion liters of water per
ishment per year, thus most industrial air
ants are emitted in urban areas which are on
bodies that supply large consistent water
es. The effectiveness of policies promoting
aphic dispersal to solve air pollution
ems will be limited by an adequate water
and the tendency of major employing,
using, air polluting industries to choose
sites. Such policies will only be effective if
ate water supplies are provided at alterna-
cations or that water use is eliminated from
oduction process. In themselves these condi-
lo not insure success. Raw material location,
quality, water for transportation, and input-
relationships between industries also in-
e clustering. The conjunction of air pollution
ndustrial water use indicates that much
attention should be given to the relation
en air and water pollution with some study
possibility of substitution of one form of
on for another. (Buchanan-Davidson--
nsin).
2950

ERVATION: EESG BIBLIOGRAPHY SE-
6,
g Univ. (England). Dept. of Economics.
mary bibliographic entry see Field 6B.
2953

R POLLUTION, EESG BIBLIOGRAPHY
S: 17,
stle-upon-Tyne (England). Center for
ch in Public and Industrial Economics.
orey, and P. McCabe.
(Environmental Economics Study Group)
raphy Series 17, February 1975. 14 p. 150

tors: *Management, *Economics,
ion abatement, *Bibliographies, *Industrial
Costs, Pollution taxes(Charges), Pricing,
pollution control, Environment, Water
es development, Water quality control,
treatment, Cost-benefit analysis, Wel-
onomics), Permits.
ers: *Public policy.

nomic aspects of environmental and water
n and their control are presented in 150
ces. The scope of the subjects ranges from
es for devising an approach methodology
ronmental and water pollution control, the
of bribes and charges, the efficacy of
standards, and environmental protection as
o international spillovers and trade. Other
s relate to the efficiency of public enter-
developing natural resources, capital and
g costs of sewage treatment, water supply
nand, water and waste management, ef-
water pollution, and the economic impact
ion on industries and economic incentives
r quality improvement. Other discussions
n public environmental policy, manage-
chniques and costs thereof, legal aspects,
c welfare, a multi-level approach to
and control of water pollution, marginal
ing, effluent and sewer charges, permits,
r pollution control cost functions. (Auen-
in)
63

SIN ANNUAL REPORT 1975,
reat Lakes Regional Commission, Madis-

ary bibliographic entry see Field 6B.
54

LOSSES OF NITROGEN IN SURFACE RUNOFF IN THE BLACKLAND PRAIRIE OF TEXAS,
Texas Agricultural Experiment Station, College Station.
D. E. Kissel, C. W. Richardson, and E. Burnett.
Journal of Environmental Quality, Vol. 5, No. 3, p 288-293, July-September 1976. 1 fig, 4 tab, 16 ref.

Descriptors: Nitrogen, Nitrates, *Nutrient removal, Texas, *Surface runoff, *Nitrogen compounds, Agricultural watersheds, Fertilizers, Nitrites, Leaching, Water pollution sources, Water quality, Agricultural runoff, Soil erosion, Water pollution, Nutrients, Organic matter, Runoff, Analytical techniques, Watersheds(Basins), Grain sorghum, Cotton, Oats.
Identifiers: *Nitrogen losses, *Texas Blackland Prairie, *Fertilizer losses, *Nitrate losses, *Houston Black clay, Analytical procedures, Total nitrogen, Nitrate-N.

The objective was to determine NO3-N and total N losses in surface runoff from Houston Black clay, a swelling clay soil with a relatively low infiltration rate. The study was carried out on duplicate 4-ha watersheds cropped to a rotation of grain sorghum, cotton, and oats, all fertilized at recommended rates of N application. The loss of NO3-N varied considerably during the study, depending on events before each runoff-producing storm. Concentrations on NO3-N were usually highest just after fertilizer application when the soil was near field capacity and lowest when large amounts of water infiltrated into dry soil immediately before runoff. During runoff-producing storms just after fertilizer application, the concentrations were lowest in the initial runoff and highest near the end of the runoff event. To compute NO3-N losses with reasonable accuracy on these soils, the shape of the entire NO3-N concentration curve needed to be well defined. In general, the results of this study indicated that a small and probably insignificant amount of N is lost to surface waters when crops are fertilized at recommended N rates in the Texas Blackland Prairie. For the entire 5-year study, the mean concentration of NO3-N in runoff was 2.9 and 2.3 ppm NO3-N for the duplicate watersheds. The mean total loss of NO3-N was 3.2 kg/ha/year. Losses of sediment-associated N were about 5 kg N/ha/year. (Henley - ISWS)
W76-12982

SAMPLERS FOR MONITORING RUNOFF WATERS,
Kansas State Univ., Manhattan. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5A.
W76-13006

VARIATION OF SUSPENDED SEDIMENT LOAD IN THE PALOUSE REGION OF THE NORTHWEST,
D. K. McCool, and R. I. Papendick.
Presented at the 1975 Winter Meeting of the American Society of Agricultural Engineers, December 15-19, 1975, Chicago, Illinois. 20 p, 4 fig, 9 tab, 11 ref. ASAE Paper 75-2510.

Descriptors: *Suspended load, *Suspended solids, *Sediment yield, *Sediment load, *Sampling, Water quality, Return flow, Water quality control, Water pollution, Pacific Northwest US, Washington, Idaho, Oregon.
Identifiers: *Palouse River basin area(Wash-Ida-Ore).

Sediment concentrations in the Palouse small-grain dryland region of the Northwest are extremely variable on a daily, seasonal, and annual basis. Runoff events of from one to a few days in length can account for large percentages of the annual sediment discharge, and the sediment transport of a given year can be as large as the total of 4 or 5 other years. Sampling programs based on weekly samples, even at stations with excellent streamflow records, can give extremely misleading results. Sampling programs of 1 or 2 years' duration can also give extremely misleading results. If money and personnel constraints dictate a low-frequency short-duration sampling program, then it is essential that some typical portion of the study area be monitored with a high-frequency longer-duration sampling program to assess the results and for adjustment purposes. (Skogerboe - Colorado State)
W76-13012

MEETING FUTURE WATER REQUIREMENTS BY WATER CONSERVATION,
Soil Conservation Service, Golden, Colo.
For primary bibliographic entry see Field 3F.
W76-13013

FACTORS INFLUENCING THE LOSS OF NITROGEN AND PHOSPHORUS FROM A TRACT OF IRRIGATED LAND,
Idaho Univ., Moscow. Dept. of Agricultural Engineering.
J. R. Busch, D. W. Fitzsimmons, G. C. Lewis, D. V. Naylor, and K. H. Yoo.
Presented at the 1975 Winter Meeting of the American Society of Agricultural Engineers, December 15-18, 1975, Chicago, Illinois. 11 p, 2 fig, 4 tab, 11 ref. ASAE Paper 75-2543.

Descriptors: *Nitrogen, *Phosphorus, *Irrigation effects, Surface irrigation, Irrigation, Irrigation practices, Leaching, Nutrients, Return flow, Water pollution, *Regression analysis.

A study was conducted to identify factors that influence the loss of nitrogen and phosphorus from a tract of irrigated land. A multiple regression analysis was used to determine the influences of nine identifiable factors. The statistics of the analytical relationships obtained indicate that they are suitable for estimating the amounts of nutrients lost in surface runoff from the studied tract. The amounts of chemical constituents lost in surface runoff from a gravity irrigated farm are dependent upon several independent variables including total solids lost, amounts of nutrients applied, and water retained on the field. Specific conclusions are: (1) the amounts of nutrients in the surface runoff were significantly affected by the amounts of total solids and water lost in surface runoff, and the amounts of nutrients applied in headwaters. (2) More soluble and total phosphorus and ammonia nitrogen were lost to surface runoff in earlier irrigations than in later irrigations. (3) Increasing the percentage of applied water retained on a field and reducing the amounts of fertilizer added to irrigation water would decrease the amounts of all nitrogen forms lost in surface runoff. All results presented are applicable to the study site monitored. However, the relationships developed and conclusions drawn may be applied with caution to similar areas managed with similar cultural practices. (Skogerboe - Colorado State)
W76-13014

ESTABLISHING WATER, NUTRIENT AND TOTAL SOLIDS MASS BUDGETS FOR A GRAVITY-IRRIGATED FARM,
Idaho Univ., Moscow. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 3F.
W76-13015

IRRIGATION REUSE SYSTEMS--A PROPOSED NEW ASAE ENGINEERING PRACTICE,
Colorado State Univ., Fort Collins. Dept. of Agricultural.
For primary bibliographic entry see Field 3C.
W76-13016

WHAT DO WE DO ABOUT THE WATER POLLUTION CONTROL ACT,
Watson and Co., Tampa, Fla. Environmental Services Div.
V. D. Patton.
Public Works, Vol 107, No 9, p 78-81, September, 1976.

Descriptors: *Water quality act, *Legislation, *Federal Water Pollution Control Act, *Water quality standards, Water pollution control, Pollution abatement.
Identifiers: *Federal Water Pollution Control Act Amendments, Legislation implementation.

The 1972 Federal Water Pollution Control Act Amendments, PL 92-500 are being reviewed in depth by many groups and individuals. This review has resulted in criticism of the constructive nature. This article is an example of the criticism offered. PL 92-500 is the most sweeping piece of legislation on water pollution control ever conceived. It is idealistic, assuming automatic compliance with unrealistic goals and deadlines by offenders and over-estimating the ability of the public to become sufficiently informed to make competent decisions by mass participation. There were no realistic estimates of the funding required to meet the greatly expanded definition of treatment works contained in the Act. An original concept fostered by some was that area wide waste management meant one treatment plant for a region covering perhaps several counties - this may require abandonment of existing plants still carrying bonded indebtedness. The provision for zero discharge is in some cases possible while forever impossible in others. Lack of uniformity in goals and lack of communications within some agencies is a real problem. Consultant selection has been complicated by recent legislative and administrative actions such as Florida's Consultant Competitive Negotiation Act. What is needed is: (1) A set of performance criteria to be established for state water pollution agencies in the area of implementation; (2) An improvement of communications between agencies and parts of agencies; (3) Maintaining the same priorities; (4) Realistic planning; (5) Less paperwork; and (6) Use of trained professionals. (Heiss-NWWA)
W76-13037

ENERGY DEVELOPMENT: THE ENVIRONMENTAL TRADEOFFS. VOLUME 3: RELATIVE ENVIRONMENTAL RANKING OF PROPOSED OFFSHORE CONTINENTAL SHELF AREAS ON THE BASIS OF IMPACTS OF OIL SPILLS,
Stanford Research Inst., Menlo Park, Calif.
For primary bibliographic entry see Field 6G.
W76-13039

A PROPOSED METHODOLOGY FOR ASSESSING ALTERNATIVE TECHNOLOGIES,
Cornell Univ., Ithaca, N. Y. Program on Science, Technology and Society.
For primary bibliographic entry see Field 6G.
W76-13049

PUBLIC EVALUATION OF WATER QUALITY AND ITS IMPACT ON RECREATION: A CASE FROM IOWA,
Waterloo Univ., (Ontario). Dept. of Geography.
J. S. Gardner, and P. Frankland.
Institute of Urban and Regional Research, University of Iowa, Iowa City. Technical Report No. 38, December 1974. 17 p, 1 fig, 6 tab, 26 ref.

Descriptors: *Water pollution effects, *Water quality standards, *Water quality, *Recreation, *Evaluation, Aesthetics, Turbidity, Quality control, Public health, Reservoirs, Nutrients, Sediments, Social participation, Coliforms, *Iowa.
Identifiers: *Iowa River(IA), *Coralville Reservoir(IA), *Public participation.

The Iowa River and Coralville Reservoir, a multipurpose flood control project where recreation has become a major function of the project, were studied to determine the impact of water quality on the degree of participation in and enjoyment of water-based recreation. River valleys providing natural forest cover for wildlife and sites for artificial lakes are the recreational focal points in Iowa. Recent surveys indicate that at least 80% of users of the area do so because of water-based recreational opportunities. Primary purpose of the study was to find how public evaluation of water quality differed from scientific standards of water quality. Scientific standards required accepted levels of pathogenic organisms (especially fecal coliform), toxic or skin-irritating substances, and objectionable odors or floating material. However, subjective evaluations used as criteria: trash and junk, muddy water, smell, scum, foam, taste, rough fish and dead fish. Subjective evaluations of water quality discouraged participation despite water being declared safe for recreational purposes according to state standards. Fifty-seven percent of the river basin sample refused to let their children swim in river water because of its poor quality. It was found that subjective evaluation of poor water quality did not dampen enjoyment of those who do participate. (Gentry-NC)
W76-13050

ANNUAL REPORT FOR THE YEAR ENDING MARCH 31, 1975, SASKATCHEWAN DEPARTMENT OF THE ENVIRONMENT.
Saskatchewan Dept. of the Environment, Regina.
For primary bibliographic entry see Field 6E.
W76-13052

DEVELOPMENT OF RESIDUALS MANAGEMENT STRATEGIES: AN EXECUTIVE SUMMARY,
Indiana Univ., Bloomington. School of Public and Environmental Affairs.
R. S. Howe, and N. L. White.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-251 011. Environmental Protection Agency, Report EPA-600/1-76-01/A, Socioeconomic Environmental Studies Series, Water Quality Guidance. 28 p, 5 fig, 3 tab. EPA-R-803313-01-1.

Descriptors: *Decision-making, *Management, *Cost allocation, *Cost sharing, *Planning, *Evaluation, Institutions, Model studies, Project planning.
Identifiers: *Residuals management, *Residuals discharge, *Environmental quality.

A residuals generation and discharge model is proposed which has the advantages of identifying different methods to achieve environmental standards, identifying and evaluating residuals management strategies (RMS), identifying at different points of residual generation and discharge when intervention with physical measures can take place. The study is designed to identify and describe means for achieving environmental quality in a fair and cost effective way, and to help decision makers find and implement residuals management programs. The planning process should determine goals and objectives, including identifying and selecting strategies for achieving goals. Such decisions require consideration of (1) factors influencing plans for the environment: the level of environmental quality desired, costs to achieve that level of quality, who pays the cost, benefits, strategies to achieve the goal, and (2) constraints on environmental management: economic, legal, political, technical, social. In selecting a strategy, a RMS combines 3 components - physical methods, implementation of physical methods, and institutional arrangements supporting implementation measures. To develop and evaluate a RMS it is necessary to (1) define the problem; (2) specify all physical methods; (3) analyze alternative physical methods; (4) identify implementation measures and institutional arrangements; (5) formulate alternative RMS; evaluate alternative RMSs, and (7) choose str for implementation. (Gentry-North Carolina)
W76-13054

OPERATION AND IMPACT OF NPDES IN GION II, PART 2,
Environmental Protection Agency, New Caribbean Construction Grants Branch.
W. J. Muszynski, and T. J. Olenik.
Water and Sewage Works, Vol. 123, No. 6, 95, June, 1976. 2 tab, 10 ref.

Descriptors: *Permits, *Regulation, *Indu wastes, Pollutants, Economics, Monitoring fluents, New York, New Jersey, Puerto Rico gin Islands, Programs, Cost analysis, Bioche oxygen demand, Suspended solids, Waste treatment, Equipment, *Economic impact, *W quality standards.
Identifiers: *National Pollutant Disch Elimination System.

The National Pollutant Discharge Elimin System is discussed in terms of the permit gram's operation and its physical and econ impact on municipal dischargers in the Regi area which includes New York, New Jersey, to Rico, and the Virgin Islands. The monito testing, and reporting requirements of the p program are generally much more stringent previous requirements under state programs. permits require weekly 24-hour composite pling of biochemical oxygen demand suspended solids. Case histories of the econ impacts of the permit program are reviewe the upgrading of existing facilities, indu waste monitoring, and the installation of monitoring, and chlorination equipment detailed cost analysis is presented for each reviewed. (See also W76-10005) (Kreager-FIR
W76-13059

A BRIEF HISTORY OF SEWAGE TREATM - 2 THE ROYAL COMMISSION,
J. M. Sidwick.
Effluent and Water Treatment Journal, Vol No. 4, p 193-195, 197-199, April, 1976.

Descriptors: *Organizations, *History, *Se treatment, *Industrial wastes, Waste water t ment, Estuaries, Sewers, Standards, *Water q ty standards.

An historical review of the establishment an tivities of the Royal Commission on Se Disposal is presented. The Commission wa pointed on May 7, 1898 to investigate metho treating and disposing of sewage. Activities c Commission included: the identification of a cial treatment processes, an evaluation problems associated with the discharge of t wastes into municipal sewers, studies of the op tional characteristics of various sewage treat methods, the investigation of problems assoc with the disposal of distillery wastes and nuisances caused by seaweed in sewage pol estuaries, recommendations for standards which sewage works effluent should conform studies on methods for treating industrial wa not discharged to municipal sewers. (Krea FIRL)
W76-13060

ONSHORE IMPACTS OF OIL AND DEVELOPMENT IN ALASKA, VOLUME I.
Resource Planning Associates, Inc., Cambri Mass.
Available from the National Technical Info tion Service, Springfield, VA 22161 as PB-248 $6.00 in paper copy, $3.00 in microfiche. Re Reference No. RA-75-28 prepared for U.S. vironmental Protection Agency, November 1 142 p, 3 append.

LIBRARY OF THE UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN

riptors: *Continental Shelf, *Alaska, ronmental effects, *Water quality, *Oil pol-, *Air pollution, *Water pollution, urces development, Economics, Gases.
fiers: *Outer Continental Shelf, Environ-l impact.

otential secondary impacts, both economic nvironmental, on Alaska resulting from OCS ll as on onshore oil and gas development will stantial. These impacts will be felt on a local in varying degrees of severity. The quantifi- of these local area results is contained in detail in an appendix. Some localities, such chorage and Fairbanks, will receive impacts nearly every development possibility, while , such as Nome, Valdez, and Yakutat, will ence impacts from only a few conditions. lso W76-13091) (Sinha-OEIS)
3090

ORE IMPACTS OF OIL AND GAS LOPMENT IN ALASKA. VOLUME II. IODOLOGY APPENDICES.
rce Planning Associates, Cambridge, Mass.
ble from the National Technical Informa-ervice, Springfield, VA 22161 as PB-248 896, in paper copy, $3.00 in microfiche. Report nce No. RA-75-28, prepared for U.S. En-nental Protection Agency, November 1975. 3 append. 68-01-2465.

ptors: *Continental Shelf, *Alaska, *Oil on, *Resources development, onmental effects, *Air pollution, *Water on, *Land use, Methodology, Water ces, Economics.
iers: *Outer Continental Shelf, Environ- impact.

st step in the methodology is an analysis of ential components of a general model of oil s development. Each of these components is efined. The next step is to make a series of otions that are essentially a set of parame-the components. Next an appropriate set of otions is selected that map the model onto ndividual area of the study to yield a pment alternative. Finally, the development tives are ranked cumulatively. (See also 3090) (Sinha-OEIS)
3091

TER-QUALITY SIMULATION MODEL WELL MIXED ESTUARIES AND AL SEAS: VOLUME VIII, AN EN-RING ASSESSMENT,
orp., Santa Monica, Calif.
nary bibliographic entry see Field 2L.
093

OARD OIL-IN-WATER CONTENT MONI-ASED ON SMALL ANGLE FORWARD SCATTERING,
Electric Co., Philadelphia, Pa. Re-entry vironmental Systems Div.
tis, and F. Calello, Jr.
le from the National Technical Informa-rvice, Springfield, VA 22161 as ADA-022 50 in paper copy, $3.00 in microfiche. U. S. Guard Final Report No. USCG-D-35-76, er 1975. 183 p, 59 fig, 46 tab. DOT-CG-32,

tors: *Oil spills, *Monitoring, *Oil pollu-tergents, Particle size, Performance, Test-edures, Measurement, Continental Shelf, entation, Equipment, *Pollutant identifi-

rs: *Outer Continental Shelf, Optical scat-unker oil, Particulate matter.

development of an on line Oil-in-Water Monitor is presented. The basic technique al scattering monitoring has been main-tained. Performance verification in various test situations was conducted. Interferences such as particulate matter, gravity, pH of water, salinity of water, and temperature of water were investigated; the only serious interference being small particulate matter. Effects of oil droplet size, detergents and type of oil on monitor performance were also investigated. At its present level of development the monitor will produce errors of less than + 10% within a single oil type at 125 ppm level. At the same level, errors less than + 14% can be expected from oil mixtures without Bunker C. Oil mixtures including Bunker C produced an error band of + 33%. (Sinha-OEIS)
W76-13094

PROFESSIONAL BIAS AND WATER REUSE,
George Williams Coll., Downers Grove, Ill.
J. H. Sims, and D. D. Baumann.
Economic Geography, Vol 52, No 1, p 1-10, 1976. 1 fig, 5 tab, 8 ref.

Descriptors: *Decision making, *Professional personnel, *Water reuse, *Attitudes, Psychological aspects, Potable water, Waste water treatment, Recycling.
Identifiers: Consulting engineers, Health officers.

The attitudes, feelings, and expectations of consulting engineers and public health officials toward public use of renovated wastewater were evaluated by showing them a picture of seven men attending a mayoral conference to discuss the possibility of coping with an impending water shortage by using reclaimed wastewater. They were asked to tell a story describing who the men were; what was happening; what the men were thinking, feeling, and saying; and how they thought the situation would turn out. The results revealed orientations based on their initial attitudes toward such a proposal, perceptions of problems which might be encountered, personal concerns, and professional position. Health officials were more negative: they resisted the idea, raised many major objections, and their reflection strengthened their antagonism. Consulting engineers had a more favorable attitude at first, raised fewer objections, and were divided between endorsement or rejection. This projective technique showed the nature and strength of professional support and resistance to water reuse. The responses reflected professional expertise and bias. The psychological bias inherent in professional experts and the full range of its implications in the formulation and implementation of public policy on environmental issues needs to be identified. (Buchanan-Davidson--Wisconsin)
W76-13096

THE BUDDING ENVIRONMENTAL CLEAN-UP (A VIEWPOINT): PART II. CLEAN UP, COSTS AND GROWTH,
Northeastern Illinois Univ., Chicago. Dept. of Earth Sciences.
R. H. Charlier, and M. Vigneaux.
International Journal of Environmental Studies, Vol 8, No 1, p 121-136, 1975. 71 ref.

Descriptors: *Attitudes, *Industrial production, *Pollution abatement, *Environmental sanitation, Foreign countries, United States, Waste disposal, Water pollution, Air pollution, Legislation, Costs, Penalties(Legal), Oceans, Economics.
Identifiers: *Environmental protection, *Economic growth.

There is world-wide concern about environmental deterioration. Earth Day 1970 aroused public interest in some of the major areas of concern and stimulated some excellent programs, but lacked impetus. Some of the environmental protection efforts which have been started in the United States, France, and other countries are described. Water and air pollution are very acute problems in many parts of the world, but corrective actions have been piecemeal, sporadic, and uncoordinated. A national and international policy which would conserve and protect our natural resources is needed. Legislation is a step in the right direction, but too often enforcement is lacking. Developments to prevent pollution by petroleum products are described. Various methods have also been developed to handle garbage. At a meeting of representatives from 91 nations, a list of substances which should not be dumped into the ocean was developed, but the group lacks the force of law. Also there is the conflict between environmental protection and economic growth. (Buchanan-Davidson--Wisconsin)
W76-13098

SEAFOOD PROCESSING IN RELATION TO COASTAL INDUSTRIAL PARK CONCEPTS,
North Carolina State Univ., Raleigh. Dept. of Food Science.
For primary bibliographic entry see Field 6B.
W76-13101

APPARATUS AND METHOD FOR PROTECTING A SHORELINE AGAINST CONTAMINATION FROM AN OIL SPILL,
RRC International, Inc., Latham, N.Y. (Assignee).
M. Goldman.
U.S. Patent No. 3,962,083, 4 p, 9 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 947, No 2, p 755, June 8, 1976.

Descriptors: *Patents, *Oil spills, *Oil pollution, Coasts, Beaches, Shores, Water pollution, Absorption, Plastics, Mechanical equipment.
Identifiers: Amphibious vehicles, Oil-absorbing web.

A method and apparatus is described to protect the shoreline from contamination due to the deposit of oil from an oil spill on adjacent waters. A protective oil-absorbing blanket or web is laid on the shoreline, preferably in anticipation of the arrival of an oil spill. The web-laying vehicle includes a body which is watertight and which is mounted on six wheels having relatively soft tires. This all-terrain vehicle which is amphibious has a suitable frame for supporting a coiled web and for guiding the web onto the shoreline as the vehicle moves along. The vehicle also has the means for loading the web back onto it and means for extracting the oil. The web may be fabricated from two layers of cellulose fibers supported on an intermediate scrim or a heavy molded plastic netting confining shredded polyolifins. (Sinha-OEIS)
W76-13144

RETRIEVAL MEANS FOR A FLOATING LIQUID SPILLING,
W. P. Kirk, and D. W. Reynolds.
U. S. Patent No. 3,963,617, 4 p, 6 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 947, No 3, p 1264, June 15, 1976.

Descriptors: *Patents, *Oil spills, *Oil pollution, *Water pollution control, Water pollution, Pollution abatement.
Identifiers: Oil slicks.

An apparatus for recovering floating liquids is comprised of a sheet with a weighted periphery. The sheet is deployed by use of explosives which spreads the sheet horizontally over the liquid surface, after which the periphery submerges, confining and centrally concentrating the floating oil. In addition to the weights, the flexible sheet is provided with flotation and vent means to provide buoyancy and to facilitate the venting of air entrapped between the sheet and the spill during deployment. A line is secured to the weights at the edge of the sheet and passes through a loop on the opposite edge which tends to pull the edges of the sheet together thereby assisting in collapsing the structure. The line is also provided with an additional length to form a tow line. (Sinha-OEIS)
W76-13152

METHOD OF REMOVING MATERIAL FROM A BED OF A BODY OF WATER,
T. A. Mathieu.
U. S. Patent No. 3,964,184, 4 p, 4 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 947, No 4, p 1458, June 22, 1976.

Descriptors: *Patents, *Water pollution, *Water quality control, Bodies of water, Water pollution sources, Mine wastes, Hydraulic equipment, Turbulence, Fluid mechanics, Dredging.
Identifiers: Barite, 'Mud pits'.

A method is provided for removing material, such as cuttings and barite from bodies of water such as so-called mud pits which are simply ponds, lakes or like bodies of water whose beds are covered by the material which is to be removed. However, since the material is rather dense due to having settled to the bottom, the method includes utilization of a floating hull such as a platform from which water is drawn from the body of water close to its upper surface. The drawn water is formed into generally parallel pressurized streams inclined to the horizontal and directed rearward from the stern of the hull and released at points substantially removed from and generally equidistant from the hull and adjacent to the material for creating a turbulence and admixing the material and water. Then the material-water admixture is collectively withdrawn and disposed of. The water is picked up relatively particle free during initial operation of the barge. The primary key to achieving the turbulence or jetting action is the fluid velocity and not pressure. The more gallons pumped through the jets, the quicker the particles will combine with the water to form the material-water (slurry) admixture. (Sinha-OEIS)
W76-13155

METHOD AND APPARATUS FOR PRECIPITATING COLLOIDS FROM AQUEOUS SUSPENSIONS,
Canton Textile Mills, Inc., Ga. (Assignee).
For primary bibliographic entry see Field 5D.
W76-13159

DESCRIBING VARIANCE WITH A SIMPLE WATER QUALITY MODEL AND HYPOTHETICAL SAMPLING PROGRAMS,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W76-13162

DESIGNING REGIONALIZED WASTE WATER TREATMENT SYSTEMS,
Ohio State Univ., Columbus. Department of Civil Engineering.
For primary bibliographic entry see Field 5D.
W76-13166

OPTIMAL ESTIMATION OF DO, BOD, AND STREAM PARAMETERS USING A DYNAMIC DISCRETE TIME MODEL,
Purdue Univ., Lafayette, Ind. School of Electrical Engineering.
For primary bibliographic entry see Field 5A.
W76-13167

DEVELOPMENT AND APPLICATION OF A WATER RESOURCE ALLOCATION MODEL,
Engineering-Science, Inc., Berkeley, Calif.
W. O. Maddaus, and J. M. McGill.
Water Resources Research, Vol. 12, No. 4, p 767-774, August 1976. 3 fig, 8 ref.

Descriptors: *Water resources development, *Water allocation(Policy), *Water supply, *Water quality control, *Alternative planning, *Waste water(Pollution), *Management, Water demand, Constraints, Water policy, *Groundwater, Environment, Reservoirs, Arizona, Regions, Digital computers, Mathematical models, Optimization, Systems analysis.
Identifiers: Cost minimization, Cost effective, *Tucson(Arizona).

A water resource optimization model is described for use in long-range infrastructure planning for water supply and waste water management. The model includes a network analyzer to determine least-cost allocation of available sources of water supply (including reclaimed waste water) to various demand points subject to certain physical constraints and water management policies, a recosting procedure for nonlinear cost functions, a digital groundwater model for simulating widespread changes in groundwater depth, and a salt balance model for simulating groundwater quality changes with time. The modeling system provides costs for the optimal water resource allocation for various sets of constraints as well as the environmental changes in the groundwater reservoir, as represented by the number of years until groundwater levels fall to 76 m below 1970 levels and quality of the supply. The most cost-effective alternative has been identified and used to develop a 50-year water supply and waste water management plan for the Tucson Arizona regional area. The least-cost alternative is identified as the serving of all projected water needs from groundwater sources and augmenting the groundwater in the northern portion of the study area by recharing with reclaimed water along the Rillito River. (Bell-Cornell)
W76-13168

REMOVAL OF TRACE ELEMENTS BY THE DNESTR RIVER, (IN RUSSIAN),
Y. V. Bumbu.
Izv Akad Nauk Mold SSR Ser Biol Khim Nauk. 4, p 59-62, 1973.

Descriptors: *Trace elements, Rivers, Absorptions, Aquatic animals, Maganese, Zinc, Copper, Cobalt, Iodine.
Identifiers: Dnester River(USSR).

The results of a 2-yr study of the content and removal of trace elements by the Dnestr River (USSR) are presented. In the Dnestr the content of such biologically active and vitally necessary elements as I and Co is 3-4 times less than the less active elements Cu, Zn and Mn. The levels of trace elements in the river and their removal can be arranged in the descending order Mn-Zn-Cu-Co-I. The minimum level of trace elements and their removal by the river occurred in July. This is attributed to their increased utilization by aquatic organisms and absorption by suspended organic and mineral particles and mud.–Copyright 1975, Biological Abstracts, Inc.
W76-13197

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

ADMINISTRATION - SYSTEMS ANALYSIS, (LITERATURE REVIEW),
Cornell Univ., Ithaca, N. Y. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 5G.
W76-12926

METHODOLOGY FOR THE SELECTION AND APPLICATION OF PROBABILITY MODELS FOR THE SIMULATION OF DAILY RAINFALL AND RUNOFF,
Purdue Univ., West Lafayette, Ind. School of Civil Engineering.
For primary bibliographic entry see Field 7A.
W76-12994

A PROPOSED METHODOLOGY FOR SESSING ALTERNATIVE TECHNOLOGIE
Cornell Univ. Ithaca N. Y. Program on Sc Technology and Society
For primary bibliographic entry see Field 6G
W76-13049

DESCRIBING VARIANCE WITH A SI WATER QUALITY MODEL AND HYPOT CAL SAMPLING PROGRAMS,
Massachusetts Inst. of Tech., Cambridge. D Civil Engineering.
For primary bibliographic entry see Field 5B
W76-13162

OPTIMAL DESIGN OF CHLORINA SYSTEMS,
Malviya Regional Engineering Coll., (India).
For primary bibliographic entry see Field 5F
W76-13163

DYNAMIC PROGRAMMING MODEL WASTEWATER PLANT INVESTMENT,
Michigan Univ., Ann Arbor. Dept. of Civ gineering.
For primary bibliographic entry see Field 5D
W76-13164

OPTIMAL DESIGN OF WASTEWATER LECTION SYSTEMS,
Roorkee Univ. (India).
For primary bibliographic entry see Field 5D
W76-13165

DESIGNING REGIONALIZED WASTE W TREATMENT SYSTEMS,
Ohio State Univ., Columbus. Department o Engineering.
For primary bibliographic entry see Field 5D
W76-13166

DEVELOPMENT AND APPLICATION WATER RESOURCE ALLOCATION MOD
Engineering-Science, Inc., Berkeley, Calif.
For primary bibliographic entry see Field 5G
W76-13168

THE USE OF LINEAR PROGRAM TECHNIQUES FOR ESTIMATING BENEFITS FROM INCREASED ACCURAC WATER SUPPLY SYSTEMS,
Battelle Memorial Inst., Columbus, Ohio.
J. L. Moore, and J. M. Armstrong.
Water Resources Research, Vol. 12, No. 4, 639, August 1976. 3 fig, 5 tab, 16 ref.

Descriptors: *Water supply, *Forec *Linear programming, *Irrigation, *Agricu *Decision making, Optimization, Estim Benefits, Probability, Computer programs, surement, Assessment, Crops, Economic come methodology, Mathematical m Systems analysis, Risks.
Identifiers: *Bayesian statistics, Crop pla Net benefits, Model testing.

Probabilistic linear programming technique Bayesian statistics are combined in this pa utilizing an example from the area of ir agriculture and water supply forecasts to the value of increased forecast accuracy to sion units. The case studied was confined to period analysis involving (1) a crop pla period and (2) a growing and harvesting p The model is developed in terms of Bayesian ysis and demonstrates how linear programir be applied to rather complex decision m problems involving uncertainty. Testing model involved the use of an IBM compute gram available at the University of Michiga

ıs assumptions as to supplemental water
, the model showed a net benefit to irriga-
f about $6/acre for a reduction in uncertainty
% resulting from the introduction and im-
ment of water supply forecasts. (Bell-Cor-

3169

Evaluation Process

TAT EVALUATION PROCEDURES.
nd Wildlife Service, Washington, D.C., Div.
logical Services.
imary bibliographic entry see Field 6G.
2845

E ENGINEERING: MAKE SURE THE S ARE RIGHT,
s (James S.) and Associates, Inc., Farming-
onn.
mary bibliographic entry see Field 5D.
2906

PLE FOR REGIONAL PLANNING OF R QUALITY IN DENMARK (BEISPIEL REGIONALEN PLANUNG DER ESSERQUALITAET IN DAENEMARK),
mary bibliographic entry see Field 5G.
2918

ATES OF SOCIO-ECONOMIC GES OF AN OIL SPILL,
e for Water and Air Pollution Research,
olm (Sweden).
mary bibliographic entry see Field 5G.
2947

ECONOMICS OF RECOVERY OF RIALS FROM INDUSTRIAL WASTE--A STUDY,
Univ., Birmingham (England). Dept. of
al Engineering.
nary bibliographic entry see Field 5D.
948

STAGES TOWARDS RANCHING SAL-N OCEAN RANGES,
ional Aquaculture Consultancy, Isle of
ngland).
er.
News International, Vol. 15, No. 1, p. 20-
. 4 fig.

tors: *Salmon, *Oceans, Fish hatcheries,
nagement, Fish migration, Fish stocking,
fisheries, Fish behavior, Fish farming,
the Sea, South America, Alaska, Ocean

rs: Aleutian Islands, Kurile Islands, Ice-
lkland Islands, Kerguelen Islands, Chile,
n Hemisphere.

sibility of deliberately modifying ocean
k composition and abundance is being
An International Law of the Sea must
e the ocean as an open range that can be
ted and managed to produce desirable
lanagement should be by an international
y body. Migratory stocks can be most ef-
harvested and managed at terminal fishe-
rritorial water of coastal states. Salmon
sidered the most suitable genus for a
nent system to take advantage of natural
nge productivity. A ground-work for a
nent system would be a worldwide inven-
salmon rivers, production ranges, and
for improvement of stocks. Saltwater
echniques indicate that migration and dis-
of hatchery-bred salmon after release
rine environment can be altered. Salmon
s and nurseries could be established on the southeastern Alaskan Archipelago, Aleutian Islands, Kurile Islands, Iceland, the southern extremity of South America, Falkland Islands, and Kerguelen Islands. An inshore terminal salmon fishery near the Strait of Magellan would be economically and ecologically attractive. Establishment of a system for hatching, rearing, planting, and recovering salmon in southern Chile would encourage development of an ocean range management system that could be incorporated into the Law of the Sea. (Buchanan-Davidson--Wisconsin).
W76-12949

DOES WATER USE RESTRICT THE LOCATION OF INDUSTRIAL AIR POLLUTERS,
Argonne National Lab., Ill.
For primary bibliographic entry see Field 5G.
W76-12950

THE SOCIAL AND ECONOMIC IMPORTANCE OF THE CARONI SWAMP IN TRINIDAD AND TABAGO,
Michigan Univ., Ann Arbor. Dept. of Natural Resources.
For primary bibliographic entry see Field 6G.
W76-12952

CONSERVATION: EESG BIBLIOGRAPHY SERIES:16,
Reading Univ. (England). Dept. of Economics.
M. J. Stabler.
EESG (Environmental Economics Study Group) Bibliography Series 16, February 1975. 19 p. 216 ref.

Descriptors: *Bibliographies, *Conservation, *Natural resources, *Exploitation, *Economic justification, *Cost-benefit analysis, Social aspects, Industrial production, Projections, Energy, Welfare(Economics), Decision making, Legal aspects, Economic rent, Environment, Pollutants, Marine fisheries, Public rights, Evaluation.
Identifiers: *Public policy.

The scope and nature of economic analysis of conservation of stock resources, amnity resources, the aspects of costs and effects of pollution, the preservation of wildlife and natural scenery, and the social costs of economic growth are reflected in 216 citations. The added dimension considered is the relationship between growth and environmental quality and the problem of conservation concerned with depletion of natural resources in connection with the energy crisis. Discussions evaluate the precise definition of conservation, its boundaries, and the interpretation of the intertemporal use of natural resources from an economic standpoint, decisions on the rate of utilization of resources, such as aspects of soil conservation, fishery, energy resources, pollution, ecology, and the quality of the environment, as well as the spatial analysis of conservation. Also covered is the concern for conservation of resources not only related to the problem of rate of utilization but where property rights are not clearly, or cannot be, defined, as for instance the fishery industry where the nature of the common property, the freedom of entry, and the dissipation of economic rent as a consequence of overutilization. Several citations discuss implicit and implied guidelines for public policy. (Auen-Wisconsin)
W76-12953

A CLUSTER ANALYSIS OF ACTIVITY, FREQUENCY, AND ENVIRONMENT VARIABLES TO IDENTIFY WATER-BASED RECREATION TYPES,
Wisconsin Univ., Green Bay. Urban Analysis.
R. B. Ditton, T. L. Goodale, and P. K. Johnsen.
Journal of Leisure Research, Vol. 7, No. 4, p. 282-295, 1975. 3 fig., 1 tab., 18 ref.

Descriptors: *Recreation demand, *Analytical techniques, *Water users, Behavior, Recreation, Wisconsin, Great lakes, Spatial distribution, Statistical methods, Camping, Hunting, Swimming, Fishing, Water skiing, Boating, Water sports.
Identifiers: *Recreation typology, *Cluster analysis, Picnicking, Sailing.

Cluster analyses were used to establish relationships among individuals as determined by their recreation participation measurements, utilizing a sample of 250 of 2174 heads of households surveyed in northeastern Wisconsin. The first analysis identified eight mutually exclusive clusters of individuals, distinguished by the kind and frequency of their water-based recreation activity. The second analysis based on kind, frequency, and type of environment yielded nine clusters. Inclusion of the location variable added an important dimension to these analyses. Results suggest that in terms of distinguishing behavior, individuals may first relate to environments and choose activities secondarily. Large water bodies like the Great Lakes do not appear to be distinctive attractors of water-based activity for populations when other alternatives exist and the travel dimension is relatively constant. A large minority of clusters were distinguished by participation in open water environments, but the sheer size of these resources as well as their intensive access and facility development programs have not led to noticeable shifts in participation. Excluding distance concerns, other factors relating to means and access, such as cost and durability of equipment needed, weather, and seasonality, are involved in recreation choices. (Luedtke-Wisconsin)
W76-12955

BENEFITS OF AN EXTENDED SEASON: THE EXPERIENCES OF ONE INDUSTRIAL USER,
C. H. Boyd
Seaway Review, Vol. 5, No. 2, p. 15-17, 1975.

Descriptors: *Navigation, *St. Lawrence Seaway, *Great Lakes, *Winter, *Economic impact, Monetary benefits, Indirect benefits.

The Dow Chemical Company moved 20% of its 900,000 tons of product in 1974 through the Great Lakes-St. Lawrence Seaway system. Water transportation moves larger tonnages of product with more efficient fuel consumption and less environmental disturbance. Continued extension of the seaway season would conserve fuel and reduce capital expenditures. A 10-month season would eliminate the need for a $5.7 million increase in storage capacities for the next three years. This money could be redirected toward plant expansion, thus creating new jobs and helping the economy. In 1974 Dow needed to deliver caustic soda to Thorold and Thunder Bay, which had low inventories. Alternate means of delivery would have increased shipping costs, and carrier equipment was difficult to acquire. Overland transportation would have cost $600,000, water transportation only $300,000. Therefore Dow is encouraging its Canadian customers to use storage facilities to take the product directly by water in the future. An extended navigation season can exert real anti-inflationary pressures on the economy. Based on the experiences of keeping the seaway open longer in 1974, Dow wants to keep a ship operational during the 1975 winter season and will help overcome problems in order to extend the season. (Buchanan-Davidson--Wisconsin)
W76-12956

HOW SRI LANKA PLANS TO DEVELOP HER FISHING INDUSTRY,
T. Drieberg.
Fishing News International, Vol. 14, No. 10, p. 14-16, 1975.

Descriptors: *Commercial fishing, *Asia, *Indian Ocean, Fishing gear, Fish harvest, Financing,

Boats, Foreign trade, Training, Harbors, Refrigeration, Nets, Fish handling facilities, Aquiculture.
Identifiers: *Sri Lanka(Ceylon), Fishing fleet.

Sri Lanka is developing inland and marine offshore fisheries to help meet threatened protein shortages. The Department of Fisheries was established with regulatory and development responsibilities. The present catch is largely from coastal fishing, some from inland fishing, with little deepsea fishing. The boats used cannot operate in the 30-60 mile offshore range; there is a lack of private-sector enterprises to fish in this range; import of suitable boats is prevented by shortage of foreign exchang; and there is a scarcity of trained crews. Consultants have studied local conditions and developed boat designs which eliminate defects of previous boats. Two banks will extend credit to prospective buyers. The government is providing equipment for boat repairs. A new boat will have to be designed for skipjack fishing. Due to lack of foreign exchange, other supply avenues for obtaining trawlers are being investigated, such as joint ventures with foreign companies. Centers for training coastal fishermen, developing fish product markets, and research are being established. Harbors are being developed, refrigeration facilities increased, fishing nets manufactured, and shrimp and beche-de-mer processing plants opened. Inland fisheries are being encouraged and new fish species introduced. China and other countries are furnishing technical aid. (Buchanan-Davidson--Wisconsin)
W76-12957

PLANNING FOR WATER RECREATION IN ISRAEL,
Technion-Israel Inst., of Tech., Haifa. Center for Urban and Regional Studies.
V. Kenyon, and R. Enis.
Landscape Planning, Vol. 2, No. 1, p. 45-62, 1975. 6 fig., 6 tab.

Descriptors: *Planning, *Recreation, *Water resources development, Multiple-purpose projects, Sites, Recreation facilities, Foreign countries, Lakes, Lake shores, Springs, Landscaping, Rivers, Beaches, Reclaimed water, Land uses, Water quality.
Identifiers: *Israel, Lake Kinneret(Israel), Sachne Springs(Israel), Hadera River(Israel), Dan Regional Sewage Scheme(Israel), Sequential water use.

Growing demand for outdoor recreation has placed heavy pressure on the limited water recreational sites in Israel. Its inland water resources are analyzed for their potential to meet the requirements of different recreational activities. Recreational water use is characterized by the different types of demands upon it as well as by relevant aesthetic and safety factors. Four different types of water resources are considered: water bodies or lakes, springs, rivers, and treated effluents. A planning approach utilizing one of three solutions, (a) multiple use of water, (b) sequential use of water, and (c) rationalization of land uses along water edges is illustrated. Specific cases described are lake Kinneret, which poses conflicting land and water use problems; Sachne, a sequential use of a spring; Nahal Hadera, the problem of the reorganization of a badly polluted river basin; and Dan Regional Sewage Scheme, the multiple use of improved effluent during the treatment process. It is proposed to integrate water based recreation areas into the national water planning system, developed primarily for agricultural, industrial, and domestic water supply, in order to evaluate alternative recreation sites and water projects throughout the country. (Luedtke-Wisconsin)
W76-12959

SOLAR SEA POWER,
Carnegie-Mellon Univ., Pittsburgh, Pa.
C. Zener.
Bulletin of the Atomic Scientists, Vol. 32, No. 1, p. 17-24, 1976. 3 fig., 2 tab., 20 ref.

Descriptors: *Oceans, *Energy conversion, *Electric power production, Tropic, *Solar radiation, Feasibility studies, Economic feasibility, Design.
Identifiers: *Ocean thermal energy conversion.

The feasibility, efficiency, costs and climatic effects of ocean thermal energy conversion (OTEC) to electric power are discussed. A 300 ft diameter design (illustrated) would have an approximate capacity of 100 MW, or one-tenth the capacity of a nuclear or fossil fuel power plant. A network over the entire tropical ocean could supply the world's population in the year 2000 with per capita energy now consumed by the U.S. The operation of such systems is dependent, however, on costs, potential alternative uses of ocean surface, and environmental impacts. A design of an OTEC, using ammonia circulated in a closed cycle, has been found both technically feasible and economically attractive. An alternate concept of an open cycle OTEC is also being investigated. Estimates of an OTEC plant (in 1975 dollars) based on current technology, show cost at $2100/KW as compared to $800 of nuclear cost. Advances in evaporator, condenser, pumps and pipes, etc., are expected to reduce the baseline costs of these components to about $450 from $1100, before optimization. Reoptimization of the components would further cut costs to $450/KW hour. Potential cost reductions also exist in appropriate site selection. An 25 MW module could be built and tested by 1981. (Auen-Wisconsin).
W76-12961

ENVIRONMENT AND SOCIAL CLASS, EESG BIBLIOGRAPHY SERIES 15.
Bristol Univ. (England). Dept. of Economics.
EESG (Environmental Economics Study Group) Bibliography Series 15, (undated). 3 p. 39 ref.

Descriptors: *Bibliographies, *Environment, *Income distribution, *Social aspects, Economics, Industrial production, Economic efficiency, Equity, Attitudes, Welfare(Economics), Air pollution, Social values, Urban sociology.
Identifiers: *Public policy, Noise pollution.

The general aspects of environmental protection as related to income distribution are discussed in 39 citations. Related discussions deal with the effects of economic growth, economic issues in planning urban recreation facilities, social class attitudes to air, noise, and water pollution, and congestion vs. welfare. The theory on choosing policies to reconcile distribution and allocation objectives making explicit use of a social welfare function, and the efficiency and equity in national resource and environmental policy are also cited. Industrial growth, the costs of growth, and a review of possible treatments of income distribution in cost-benefit analysis, are among the pertinent subjects. (Auen-Wisconsin)
W76-12962

WISCONSIN ANNUAL REPORT 1975,
Upper Great Lakes Regional Commission, Madison, Wis.
P. J. Lucey.
(1976), 76 p.

Descriptors: *Wisconsin, *Interstate commissions, *Regional development, Transportation, Mining, Financing, Employment, Agricultural runoff, water pollution control, Waste treatment, Cattle, Fisheries, *Great Lakes Region, Marketing, Forest management, Training, Recreation, Grants, Future planning(Projected).

The economic development through technical assistance and supplemental grants implemented by the Wisconsin Office of the Upper Great Lakes Regional Commission in the 36-county region of northern and central Wisconsin is described. S repesentative projects were the development dustrial parks and improvements to existing in trial areas such as water and sewer improvem It is estimated that these improvements will r in 2200 to 2300 new jobs and help retain an tional 300 to 400 jobs over the next three or years. The Commission also supports busines management consulting services. Financia was provided for Wisconsin Railroads, air t portation and selected bridge projects to aid i try and passenger service. Demonstration pro in soil conservation practices to reduce ag tural runoff, farm waste management, and a vey of ore deposits were conducted. A dairy program demonstrates farm management, ma ing, and increased production. Commercial fi men were assisted by a project to increase u certain fish species and better means of uti fish wastes, management, and marketing. F management information is disseminated as as the promotion of recreation and tourism goals for the next three-year plan are desc and funding requirements are indicated. (A Wisconsin).
W76-12964

IMPACTS OF RECREATIONAL DEVE MENT: THE VOYAGER VILLAGE PERIENCE,
Wisconsin Planning Office, Madison.
C. Deknatel.
February 1975. 14 p. 6 fig.

Descriptors: *Community develop *Recreation, *Lake shores, Planning, S tanks, *Wisconsin, Rural areas, Local go ments, Land use, Zoning, Economic impact vironmental effects.
Identifiers: *Voyager Village(Wis), Burnett ty(Wis), Recreation homes, Lakeshore pro development.

The controversy surrounding the early dev ment of Voyager Village, a 6000 acre second development in eastern Burnett County, Wi sin, is described. The Voyager Village pro called for approximately 4000 lots of 20,000 s feet each. Approximately 50% of the total ac was to be maintained as open space or use community facilities including a clubhouse bles, and ski chalet. It was expected to att population of about 10,000-13,000 when developed, in contrast to the Burnett Co permanent population of about 10,000. Oppo arose from some permanent residents of the as well as second-home-owners already Their basic concerns were the increased t loss of natural resources, crowding, service lake pollution from septic tank seepage, sho erosion, road runoff and increased use of The conflict between these groups, exemplif its most concrete form by the Webb Township's subdivision ordinance intend limit large-scale development, was sustained a period of years. While a number of state ag were involved in specific aspects of the de ment question, the broader issue of how n resources may best be used was never addr at the state level. Ultimately, most aspe Voyager Village were developed, with modification. (Luedtke-Wisconsin).
W76-12965

PUBLIC PARTICIPATION IN WA RESOURCES PLANNING: AN EVALUA OF THE PROGRAMS OF 15 CORPS OF GINEER DISTRICTS-SUMMARY OF EVA TION AND RECOMMENDATIONS,
Ragan (James) Associates, Pacific Palis Calif.
For primary bibliographic entry see Field 6E.
W76-13041

UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN

C PARTICIPATION IN WATER
JRCES PLANNING: AN EVALUATION
IE PROGRAMS OF 15 CORPS OF EN-
RS DISTRICTS,
(James) Associates, Pacific Palisades,

mary bibliographic entry see Field 6E.
042

OPOSED METHODOLOGY FOR AS-
IG ALTERNATIVE TECHNOLOGIES,
Univ., Ithaca, N. Y. Program on Science,
logy and Society.
nary bibliographic entry see Ficld 6G.
049

C EVALUATION OF WATER QUALITY
TS IMPACT ON RECREATION: A CASE
IOWA,
o Univ., (Ontario). Dept. of Geography.
nary bibliographic entry see Field 5G.
050

OPMENT OF RESIDUALS MANAGE-
STRATEGIES: AN EXECUTIVE SUM-

Univ., Bloomington. School of Public and
mental Affairs.
nary bibliographic entry see Field 5G.
054

SSIONAL BIAS AND WATER REUSE,
Williams Coll., Downers Grove, Ill.
nary bibliographic entry see Field 5G.
096

OD PROCESSING IN RELATION TO
AL INDUSTRIAL PARK CONCEPTS,
Carolina State Univ., Raleigh. Dept. of
ience.
omas.
tal Plains Center for Marine Development
'Report of the Conference on Marine
es of the Coastal Plains States', December
75, Savannah, Ga., p 27-28.

ors: *Fish handling facilities, *Marine
ndustries, *Optimization, Transportation,
ic feasibility, Planning, Waste treatment,

rs: *Seafood industrial parks.

ibility and benefits of establishing seafood
l parks along the South Atlantic seaboard
ned. The requirements are the provision of
deep water access, channelization, and
ion; sufficient land area should be availa-
all primary and secondary needs, with
transportation facilities, utilities, labor
s, with concomittant parking, bulkhead-
ing, fire protection, fuel, ice, ship stores,
nd electronic repair facilities. Consolida-
oods and services can reduce capital ex-
r support facilities. The benefits are that
lest time possible between fish harvest
umption tends to promote better product
short boat turn-around time, and sim-
spection. Solid and liquid waste treatment
osal, and product recovery can be con-
both from processing plants and boats.
production tends to attract processors
cient volume draws satellite industries,
ackaging materials, equipment and cord-
Freezing facilities can be better managed
nsolidation. The seafood industrial park
vide opportunities to assist fisheries
ves, municipal and state governments,
ase utilization of proteins from the sea
ucing waste. The concept promises a re-
opportunity for enhancing the seafood
industry and regional economic develop-
e also W76-09329) (Auen-Wisconsin)
1

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

CORRELATION OF RADIOACTIVE WASTE TREATMENT COSTS AND THE ENVIRONMENTAL IMPACT OF WASTE EFFLUENTS IN THE NUCLEAR FUEL CYCLE FOR USE IN ESTABLISHING AS LOW AS PRACTICABLE GUIDES-FABRICATION OF LIGHT-WATER REACTOR FUELS CONTAINING PLUTONIUM,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 5C.
W76-12694

MEADOW/MARSH SYSTEMS AS SEWAGE TREATMENT PLANTS,
Brookhaven National Lab., Upton, N. Y.
For primary bibliographic entry see Field 5D.
W76-12753

THE IMPACT OF INCREASED FUEL COSTS AND INFLATION ON THE COST OF DESALTING SEA WATER AND BRACKISH WATERS,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 3A.
W76-12778

ECONOMIC EVALUATION OF THE PROMULGATED INTERIM PRIMARY DRINKING WATER REGULATIONS,
Energy Resources Co., Inc., Cambridge, Mass.
For primary bibliographic entry see Field 5G.
W76-12821

ECONOMIC EVALUATION OF THE PROPOSED INTERIM PRIMARY DRINKING WATER REGULATIONS,
Energy Resources Co., Inc., Cambridge, Mass.
For primary bibliographic entry see Field 5G.
W76-12822

TURBULENT BED COOLING TOWER,
Purdue Univ., Lafayette, Ind.
For primary bibliographic entry see Field 5D.
W76-12847

VALUE ENGINEERING: MAKE SURE THE COSTS ARE RIGHT,
Minges (James S.) and Associates, Inc., Farmington, Conn.
For primary bibliographic entry see Field 5D.
W76-12906

ESTIMATES OF SOCIO-ECONOMIC DAMAGES OF AN OIL SPILL,
Institute for Water and Air Pollution Research, Stockholm (Sweden).
For primary bibliographic entry see Field 5G.
W76-12947

THE ECONOMICS OF RECOVERY OF MATERIALS FROM INDUSTRIAL WASTE--A CASE STUDY,
Aston Univ., Birmingham (England). Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5D.
W76-12948

SUMMARY OF THE REPORT OF THE DANIEL COMMITTEE OF INQUIRY INTO WATER CHARGES.
Water Services, Vol. 79, No. 955, p. 361-362, 1975.

Descriptors: *Water rates, *Pricing, *Water policy, Water demand, Water utilization, Legislation, Water allocation(Policy), Regulation, Domestic water, Industrial water, Sprinkler irrigation, Financing, Cost allocation, Europe.
Identifiers: England, Wales, Welsh National Water Development Authority.

The background, 1974-75 water charges, future pricing policy, relation to other water authorities, area, and accountability of the Welsh National Water Development Authority (WNWDA) are summarized. It is concluded that the Water Act of 1973 has produced an excessive difference in the average level of water charges between the WNWDA and other water authorities which should be reduced by legislation. Recommendations include giving a Welsh Assembly executive responsibility for water supplies in Wales and pricing transferred water on a commercial basis, or is the present organization is sustained the scope of commercial pricing should be extended or a levy-subsidy scheme should be developed to reduce charges to WNWDA consumers to within 10% of the national average. The necessity of these steps is based on the conclusion that providing water to consumers in rural areas such as Wales is inherently more expensive than supplying urban districts in England. (Luedtke-Wisconsin)
W76-12958

SOLAR SEA POWER,
Carnegie-Mellon Univ., Pittsburgh, Pa.
For primary bibliographic entry see Field 6B.
W76-12961

WATER POLLUTION, EESG BIBLIOGRAPHY SERIES: 17,
Newcastle-upon-Tyne (England). Center for Research in Public and Industrial Economics.
For primary bibliographic entry see Field 5G.
W76-12963

ICELAND'S WINTER COD CATCH SHOWS SERIOUS DECLINE,
D. Glen.
Fishing News International, Vol. 14, No. 12, p. 17-18, 1975.

Descriptors: *Fish harvest, *Demersal fish, Protection, Marketing, Crustaceans, Foreign countries, Tariff, International waters, Export, Freezing.
Identifiers: *Iceland, *Codfish.

Icelandic demersal fish catches and codfish landings have recently been decreasing. Iceland has declared a 200-mile fishing limit, because they believe that overfishing of cod, especially immature fish, by foreign trawlers is causing the decline. By allowing fish to grow and accumulate more weight and spawn at least once, the annual yield should increase. More than 100 species of fish have been found near Iceland, which is located at the convergence of the warm Gulf Stream and cold, nutrient-bearing Arctic currents. About 15-20 species are commercially valuable. Cod, then saithe (coley), ocean perch (redfish), haddock, and catfish are especially important. Flatfish (plaice, Greenland halibut, lemon sole, witches, and megrins) are also caught. There is concern that foreign trawlers may be depleting plaice stocks, so protective measures are proposed. Markets for the various species vary. At present flatfish are frozen whole and not filleted, but Britain has increased tariffs on whole fish, so this may change. The nephrod (Norway lobster tails) market is very lucrative. Fishing for lobster is closely protected and a strict quota enforced. A 12% British import tariff on shrimp has slowed the shrimp fishery. A new profitable product is the scallop. (Buchanan-Davidson--Wisconsin).
W76-12966

PRELIMINARY ASSESSMENT OF SYSTEMS FOR DERIVING LIQUID AND GASEOUS FUELS FROM WASTE OR GROWN ORGANICS,
National Aeronautics and Space Administration, Cleveland, Ohio. Lewis Research Center.

For primary bibliographic entry see Field 5D.
W76-12967

SOLAR ENERGY FIXATION AND CONVERSION WITH ALGAL BACTERIAL SYSTEMS,
California Univ., Berkeley. Sanitary Engineering Research Lab.
For primary bibliographic entry see Field 5D.
W76-12968

WICHITA FALLS IMIS PROJECT. WATER UTILITY PROCESSING SYSTEM APPLICATION EVALUATION REPORT,
Kansas Univ., Lawrence. Inst. for Social and Environmental Studies.
For primary bibliographic entry see Field 3D.
W76-13040

OPERATION AND IMPACT OF NPDES IN REGION II, PART 2,
Environmental Protection Agency, New York. Caribbean Construction Grants Branch.
For primary bibliographic entry see Field 5G.
W76-13059

THE BUDDING ENVIRONMENTAL CLEAN-UP (A VIEWPOINT): PART II. CLEAN UP, COSTS AND GROWTH,
Northeastern Illinois Univ., Chicago. Dept. of Earth Sciences.
For primary bibliographic entry see Field 5G.
W76-13098

SHRIMP SUPPLIES IN THE SOUTHEAST AND THEIR EFFECT ON PROCESSING FIRM SIZE,
Florida Univ., Gainesville. Dept. of Food and Resource Economics.
J. C. Cato.
In: Coastal Plains Center for Marine Development Services 'Report of the Conference on Marine Resources of the Coastal Plains States', December 11-12, 1975, Savannah, Ga., p 37-39.

Descriptors: *Industries, *Fish handling facilities, *Southeast U.S., *Florida, Economic impact, Import, Industrial production, Fish harvest.
Identifiers: Shrimp harvest deficit.

The growing deficit in the domestic shrimp supply and its effect on the shrimp processing industry in the Southeast are discussed. Shrimp products accounted for $89 million, representing 61% of all seafood processed in the region and 76% of all shrimp processed in the U.S. in 1973. While the processing industry has been growing, shrimp landings in Florida have declined from about 50 million pounds in 1960 to almost one-half, due primarily to a change in landing patterns and structural changes within the industry. The declined shrimp supply promotes Mexican and Indian imports, which have increased substantially. The supply problem has affected the historical entry-exit patterns of firms in the industry; new entrants and existing processors must make a careful choice of product lines, plant locations, size of operations, and consider increased transportation costs. Entry of small firms into the industry will be enhanced if they have an isolated market and/or produce a specialty product. Large and small firms will be much more viable than medium size firms. The Florida shrimp processing industry will reach an equilibrium of 19 in 1985. The number of small firms will increase, medium size firms will decline, and the number of large firms will remain stable. (See also W76-09329) (Auen-Wisconsin)
W76-13103

DYNAMIC PROGRAMMING MODEL FOR WASTEWATER PLANT INVESTMENT,
Michigan Univ., Ann Arbor. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W76-13164

OPTIMAL DESIGN OF WASTEWATER COLLECTION SYSTEMS,
Roorkee Univ. (India).
For primary bibliographic entry see Field 5D.
W76-13165

DEVELOPMENT AND APPLICATION OF A WATER RESOURCE ALLOCATION MODEL,
Engineering-Science, Inc., Berkeley, Calif.
For primary bibliographic entry see Field 5G.
W76-13168

6D. Water Demand

A NON-LINEAR PROGRAMMING MODEL FOR EVALUATING WATER SUPPLY POLICIES IN THE TEXAS COASTAL ZONE,
Texas Univ. at Austin.
R. A. Rios.
Available from University Microfilms, Inc., Ann Arbor, Mich., 48106. Order No. 76-8095. Ph.D. Thesis, 1975, 123 p.

Descriptors: *Water supply, *Water users, *Municipal water, *Industrial water, *Model studies, Water resources development, Water reuse, Water policy, Coasts, *Texas, *Water demand.
Identifiers: Non-linear programming models, Corpus Christi(Tex).

The water supply in Corpus Christi, Texas, could become a constraint on the area's development due to limits of available industrial and municipal supplies. A non-linear model was used for determining the quantity of fresh water needed for future demands and evaluating alternate methods to reduce demand on the primary source. In 1974 the use of the available water resources was less than optimal. Three policies for reducing water demand were studied. These increased fresh water and effluent disposal costs for various groups of users under specific conditions. Uniformly increasing the fresh water cost for all users produced maximum recycle and effluent reuse, resulting in zero discharge of waste water. The total system cost was increased most by this uniform increase. Increasing fresh water cost for industry only produced zero discharge for industrial waste water, but not zero discharge, since no economic incentive for reusing municipal waste water was provided. An effluent tax increasing disposal cost also produced zero discharge for industrial waste water, but reduced municipal demand less than the other policies did. About one-third reduction in total demand could be achieved. These policies would raise waste water treatment and fresh water supply costs considerably, but total costs would still be approximately 1 to 2% of the gross output of the industrial sector in the area. (Snyder-FIRL)
W76-12680

A PLAN FOR STUDY OF WATER AND ITS RELATION TO ECONOMIC DEVELOPMENT IN THE GREEN RIVER AND GREAT DIVIDE BASINS IN WYOMING,
Geological Survey, Cheyenne, Wyo.
H. W. Lowham, L. L. De Long, and K. D. Peter, et al.
Open-file report 76-349, May 1976. 92 p, 37 fig, 11 tab, 73 ref.

Descriptors: *Water resources development, *Water demand, *Water quality, *Hydrologic data, *Wyoming, Projections, Available water, Surface waters, Groundwater resources, Water yield, Chemical analysis, Data collections, Mining, Economic prediction.
Identifiers: *Great Divide Basins(Wyo), *Green River(Wyo).

Development of extensive coal, oil, gas, trona, and oil-shale resources as well as other developments in the Green River and Great Divide Basins in Wyoming will require a projected increase in water consumption of 490,000 acre-ft per year 2020. Developments of energy resources in o parts of Wyoming will also require large amou of water; transbasin diversion of Green R water to other areas could total an additio 270,000 acre-ft per year. In anticipation of thi creased demand, water planners and mana need much more information about avail ground and surface waters, present quality of waters, and hydrologic effects that would caused by development of energy resources. U.S. Geological Survey is conducting an exten hydrologic study of the basins. This report s marizes the study plan and discusses partic methods of approach that would be utilized in study. Regarding water quality, particular at tion is being given to trace metals, biolog characteristics, and trend analyses of sali Channel-geometry techniques, detailed statis analyses, and mathematical models are being plied to surface-water studies. An updated wel ventory, aquifer tests, and borehole and sur geophysical surveys are being used in gro water studies. (Woodard-USGS)
W76-12805

EXAMPLE FOR REGIONAL PLANNING WATER QUALITY IN DENMARK (BEISP EINER REGIONALEN PLANUNG GEWAESSERQUALITAET IN DAENEMARK
For primary bibliographic entry see Field 5G.
W76-12918

PLANNING FOR WATER RECREATION ISRAEL,
Technion-Israel Inst., of Tech., Haifa. Cente Urban and Regional Studies.
For primary bibliographic entry see Field 6B.
W76-12959

MEETING FUTURE WATER REQUIREME BY WATER CONSERVATION,
Soil Conservation Service, Golden, Colo.
For primary bibliographic entry see Field 3F.
W76-13013

MORE WATER: ONE CITY'S PLAN,
Henningson, Durham and Richardson, Inc., derson, Tex.
W. Haygood, and R. B. Stokes.
Water and Sewage Works, Vol 122, No 12, 56, 1975. 1 fig, 1 tab.

Descriptors: *Water resources, *Cities, *F planning(Projected), *Water supply, *T Water wells, Population, Projections, Reserv Water demand, Groundwater resources, W storage, Water distribution(Applied).
Identifiers: *Henderson(Texas).

A long-range water supply development pla Henderson, Texas, includes development o existing water well system to its ultimate cap and alternatives for future surface water sup based on population projections for future demands. Projections indicate that the ave daily demand in 1995 will be 2.82 mgd with a imum of 6.2 mgd; for 2025 it is projected tha demand will be 5.32 mgd with a maximum of mgd. The total water supply capacity availa approximately 7.3 mgd. Existing wells wi adequate beyond 1995 if developed to full cap and maintained in good operating condition. W should be pumped into ground storage tanks wells rather than directly into the distrib system to enable the well to produce its maxi rated capacity. Future wells should be drilled of the city, properly spaced, and piped to gr storage facilities. New water mains and st tanks should be installed as additional well developed. Negotiations with the Texas Uti Services, Inc., should be conducted to deter the feasibility of utilizing their proposed rese as a municipal water supply. Construction

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le raw water intake structure prior to the uction of that reservoir should assure a vir- unlimited water supply in the future. nan-Davidson--Wisconsin)
3097

Water Law and Institutions

OF WORK, RED RIVER BASIN ABOVE ON DAM.
nservation Service, Temple, Tex.
mary bibliographic entry see Field 4A.
2816

DO WE DO ABOUT THE WATER POL- N CONTROL ACT,
and Co., Tampa, Fla. Environmental Ser- iv.
mary bibliographic entry see Field 5G.
037

C PARTICIPATION IN WATER RCES PLANNING: AN EVALUATION E PROGRAMS OF 15 CORPS OF EN- R DISTRICTS-SUMMARY OF EVALUA- ND RECOMMENDATIONS,
(James) Associates, Pacific Palisades,

gan.
ngineer Institute for Water Resources, Ft. Va., Supplement to IWR Contract 75-6, November 1975. 54 p.

tors: *Evaluation, *Planning, *Water es development, *Decision making, ement, *Financing, *Human resources, participation, *Coordination.
rs: *Public participation, *Public informa- gency coordination, *Army Corps of en- istricts.

nitment to public participation in water s planning was reemphasized by the f Engineers. To achieve this end, the sued a process to evaluate its own per- e. Eight criteria for evaluation are as fol- e extent to which (1) recommended plans ommunity-expressed needs and desires, offices present study information to the o increase understanding and elicit ful comments, (3) field offices provide the ith opportunities to express itself and in- planning decisions, (4) the Corps coor- s planning efforts with other agencies, (5) rticipation is integrated into field office processes, (6) field office organization agement facilitate public participation, (7) ces have adequate financial and human s to implement effective programs, (8) nd field personnel have committed them- applying the objectives of maximum rticipation. A total of 31 recommenda- e presented for improving the effective- public participation in water resources for example, field offices should (1) ublics for each study according to in- l location in addition to organizational develop ways to insure feedback to the the study progresses; and (3) provide in- intended for public comment to all in- ndividuals at least a week before all (See also W76-13042) (Gentry-North

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PARTICIPATION IN WATER CES PLANNING: AN EVALUATION PROGRAMS OF 15 CORPS OF EN- DISTRICTS,
ames) Associates, Pacific Palisades,

n, Jr.

Submitted to the U.S. Army Engineer In stitute for Water Resources, Fort Belvoir, Virginia. IWR Contract Report 75-6, November 1975. 219 p, 2 append.

Descriptors: *Evaluation, *Planning, *Water resources development, *Project planning, *Decision making, Public rights, Institutions, Management, Social aspects, *Social participation.
Identifiers: *Public participation, *Army Corps of Engineer districts.

This report evaluates current (1973) public participation practices in U.S. Army Corps of Engineer offices and provides planners with specific experiential guidance on how to integrate increased participation into planning. Part one describes programs in 13 districts, none of which regularly or systemically plan for public participation. The purposes of participation, identification of publics, and various participation techniques are discussed in general terms. The programs of the Seattle District, the only field office which systematically tries to involve the public in all its studies, and the Rock Island District, which initiated additional techniques to supplement mandated public meetings, are discussed in some detail. Part 2 concerns organizing for effective participation. It is stressed that participation must be made an integral part of district policy in order for it to be effective. There must be a commitment to public involvement and an organizational structure which facilitates this. Adequate resources must be available. Part 3 details the planning process: preparing study plans, identifying problems and needs, forumulating alternatives, analyzing impacts, and evaluating impacts. District programs are analyzed in relation to these 5 study phases and recommendations for improvements are made in each section. Part 4 deals with other participation issues, including participation in post-authorization planning, and constraints which the Corps and the public place on public participation. (See also W76-13041) (Smith-North Carolina)
W76-13042

ANNUAL REPORT FOR THE YEAR ENDING MARCH 31, 1975, SASKATCHEWAN DEPARTMENT OF THE ENVIRONMENT.
Saskatchewan Dept. of the Environment, Regina.
March 31, 1975. 51 p, 16 fig, 3 plates, 6 tab.

Descriptors: *Floods, *Water supply, *Water pollution, *Environment, *Groundwater, Research, Land use, Planning, River basins, Air pollution, Water quality, *Water rights, *Canada.
Identifiers: *Qu'Appelle River Basin(Sask), Saskatchewan River(Sask).

Objectives and activities of different agency branches are described. Hydrology branch, which carries out reservoir and river system operation planning and stream-flow forecasting and collects basic hydrometric, meteorological, snow survey, sedimentation and allied data, reported that floods from extremely heavy spring snow melt caused some 20,000 acres of flood plain agricultural lands in the Qu'Appelle River Basin to be under water all summer with Moose Jaw having major flooding. Floods also affected areas of the Souris River and Saskatchewan River Basins. The Water Rights branch grants licenses for use of surface and ground water resources, estimates ground water storage and investigates other aspects of water rights. At present less than 1% of total groundwater storage capacity is pumped every day, far less than seeps into the ground. Flows into the U.S. from Lodge Creek, Battle Creek, Frenchman River and the Souris River exceeded the 50% allotted by the International Joint Commission. A major undertaking was the beginning of implementation of the Qu'Appelle Basin Study Report. Initiation of flood protection plans involved meetings with town and village councils to consider proposals for a large reservoir and a diversion channel east of Moose Jaw. Environmental Protection Service contains branches of Air Pollution Control, Water Pollution Control including water quality monitoring, and Land Protection. Policy, Planning and Research Branch develops and coordinates environmental research programs. Systems and Computer Section and Administration Branch serve the other branches. (Smith-North Carolina)
W76-13052

THE BUDDING ENVIRONMENTAL CLEAN-UP (A VIEWPOINT): PART II. CLEAN UP, COSTS AND GROWTH,
Northeastern Illinois Univ., Chicago. Dept. of Earth Sciences.
For primary bibliographic entry see Field 5G.
W76-13098

THE VIRGINIA INSTITUTE OF MARINE SCIENCE, VIRGINIA'S MARINE SCIENCE, ENGINEERING, EDUCATION, AND ADVISORY SERVICES PROGRAM,
Virginia Inst. of Marine Science, Gloucester Point.
W. J. Hargis.
In: Coastal Plains Center for Marine Development Services 'Report of the Conference on Marine Resources of the Coastal Plains States', December 11-12, 1975, Savannah, Ga., p 9-13. 2 fig.

Descriptors: *Research facilities, *Virginia, Resources development, Continental Shelf, Coasts, Continental Slope, Oceanography, Education.
Identifiers: Virginia Institute of Marine Science, *Coastal zone management, Marine resources.

The functions and scope of the Virginia Institute of Marine Science, created by Commonwealth legislative mandata, functions to maximize use of the marine resources and environments for the public welfare, to maintain their quality and to conserve resources for the future. In this context its principal tasks are to do research and engineering development on the marine resources and their uses; to provide advisory and technical services; and to provide education in all areas of marine resources and their uses; to provide education in all areas of marine science and conservation. The operational area includes all of the tidal waters of Virginia and the adjacent Atlantic Ocean. VIMS's products are knowledge, advice and other technical assistance to decision-makers, including the Commonwealth General Assembly, executive agencies, industry and the public. The Institute's current focus is on coastal zone management; Outer Continental Shelf oil and gas development; fishery management improvements; resource inventory preparation; environmental baseline and inventory preparation; wetlands preservation and management; environmental impact statements; ocean dumping and pollution; and advisory services and technical assistance programs to public and private managers and users. (See also W76-09329) (Auen-Wisconsin)
W76-13100

LEGAL ASPECTS OF PUBLIC ACCESS TO BEACHES,
Hartzog, Lader, and Richards, Hilton Head Island, S.C.
P. Lader.
In: Coastal Plains Center for Marine Development Services 'Report of the Conference on Marine Resources of the Coastal Plains States', December 11-12, 1975, Savannah, Ga., p 41-53. 73 ref.

Descriptors: *Beaches, *Public access, *Legal aspects, *Seashores, Public rights, Recreation, Coastal Plains, Prescriptive rights, Easements, Condemnation, Contracts, Zoning, Regulation, Compensation, Littoral.
Identifiers: *Coastal zone management, Tidelands.

To the extent that the demand for additional public access to beaches in the Coastal Plains Region can be met by government acquisition and traditional exercise of the police power, no extraordinary remedies are needed. But since state and local treasuries often cannot meet the needs created by national recreational goals of states' coasts, the expansion of beach recreation opportunities will likely require the use of historic legal doctrines and innovative legal mechanisms, which must also withstand the challenges of the constitutional prescription against uncompensated takings and the traditional understandings of the police power. Thus combinations of acquisition, regulation, and common law evolution are required. The discussion examines the common law tradition as related to the Public Trust Doctrine; beach acquisition by conservation regulations and easements; the police power and the taking issue; land use controls; the compensation mechanisms; and the role of the federal and state regulatory agencies. Legislative enactments by Texas, California, Washington, New Hampshire, Florida, Connecticut, Delaware, Hawaii, Louisiana, New Jersey, North Carolina and Rhode Island directed toward beach acquisition illustrate various approaches. (See also W76-09329) (Auen-Wisconsin)
W76-13104

BACK BAY NATIONAL WILDLIFE REFUGE. SOME PARALLELS IN IMPLEMENTING THE COASTAL ZONE MANAGEMENT ACT,
Back Bay National Wildlife Refuge, Virginia Beach, Va.
D. F. Holland.
In: Coastal Plains Center for Marine Development Service 'Report of the Conference on Marine Resources of the Coastal Plains States', December 11-12, 1975, Savannah, Ga., p 55-60.

Descriptors: *Public access, *Conservation, *Beaches, *Seashores, Access routes, Attitudes, Recreation, Boundary disputes, National Wildlife Refuges, *Virginia, North Carolina, Legal aspects.
Identifiers: *Coastal zone management, Back Bay Wildlife Refuge(Va).

The public opposition, legal contentions, and court decisions generated by the establishment of the Back Bay National Wildlife Refuge in Virginia, are cited as parallel impediments to be anticipated in coastal beach acquisition, planning, and management under P.L. 92-583, specifically as related to (1) inventory and designation of areas of concern, (2) priority of uses, (3) determination of permissible uses, and (4) the conrol of those uses. Up to the early 1950s no public access was available to the Refuge; but shortly after paving one road, summer homes began to multiply and real estate developments began to proliferate. By 1969 beach traffic and its attendant problems of litter, drunkenness, vandalism, car abandonment, accidents, theft and assaults were totally beyond the abilities of the Refuge management to control. Consequently, the Fish and Wildlife Service of the Department of the Interior imposed restrictions on vehicular access. A civil action was instituted by the local opposition to the restriction in the Federal District Court, with a hearing set for April 1973. The result was a temporary injunction on the restriction based on the plaintiffs' contentions of invalidity. That contention was set aside in 1975 in a strong ruling for the Department of the Interior. The experience showed that public use patterns are directly related to vehicular access. (See also W76-09329) (Auen-Wisconsin)
W76-13105

FREEING THE BEACHES: IS IT POSSIBLE,
Bureau of Outdoor Recreation, Atlanta, Ga. Southeast Regional Office.
R. M. Baker.
In: Coastal Plains Center for Marine Development Service 'Report of the Conference on Marine Resources of the Coastal Plains States', December 11-12, 1975, Savannah, Ga., p 61-64.

Descriptors: *Beaches, *Public rights, *Trespass, *Legal aspects, Public lands, Public access, Connecticut, Recreation, Seashores, High water mark, Right of Way, Easements, Adverse possession, Repulsion(Legal aspects), Zoning, Compensation.
Identifiers: *Coastal zone management, Public trust doctrine, Customary rights.

How rights to beaches already in public use can be retained, public access, and rights to new land gained (in addition to the Bureau of Reclamation's grant role) are suggested. South Carolina, Georgia, and Florida have applied the public trust doctrine to beach acquisition. A New Jersey decision ruled against excessive use charges on the interpretation that beaches and open waters must be open to all on an equal basis. Another concept that can be employed is 'Implied Dedication', which governs donations of land for public use; or else 'Adverse Use' may provide the key to beach acquisition. Oregon and California use the 'Customary Rights' device to insure the public's right to beaches by negating the private owner's right to exclude the public. Another strategem is creation of a public easement under 'Prescriptive Rights'; or the 'Subdivision Exaction'--a requirement that forces a developer to dedicate a public easement. 'Exclusive Use Zoning', which constructs a zoning district permitting only recreational and ancillary open space uses, is another device that can be applied. Donations of land can be encouraged by demonstrating potential tax advantages. Another option is 'Compensable Regulations', where the State regulates land then compensates landowners for losses. Court rulings may be favorable in all these cases under the broad umbrella of public safety, and the preservation or conservation of a unique natural area. (See also W76-09329) (Auen-Wisconsin)
W76-13106

THE ROLE OF INTERSTATE COMPACTS IN FISHERIES MANAGEMENT,
Atlantic States Marine Fisheries Commission, Washington, D.C.
I. M. Alperin.
In: Coastal Plains Center for Marine Development Service 'Report of the Conference on Marine Resources of the Coastal Plains States', December 11-12, 1975, Savannah, Ga., p 65-68.

Descriptors: *Marine fisheries, *Interstate compacts, *Institutions, *Interstate commissions, Fish management, Shrimp, Planning, Federal government, State governments, Jurisdiction.
Identifiers: *Coastal fisheries management.

The Atlantic States Marine Fisheries Commission shares with the Coastal Plains Regional Commission the five states, Virginia to Florida. The purpose of the ASMFC, as well as of the Gulf States and Pacific Marine Fisheries Commissions, is to provide for better utilization of fisheries along the seaboards. Recently these interstate compact commissions have come forth in support of a new initiative --the State-Federal Fisheries Management Program--in which the commissions play a supportive role in communications, planning, coordination and administration of the SFFMP, resulting in a cooperative effort involving the commissions as regulatory (management) institutions with state and federal administrators and scientists providing financial and technical input while the states practice reciprocal enforcement. This institutional arrangement is viewed as a practical solution to regional fisheries management. However, the viability of the commissions is threatened by House and Senate bills currently under consideration, which propose establishment of regional management councils and which would usurp the states rights and needs. The states oppose the ultimate powers vested in the Secretary of Commerce, the large council structure, and feel that federal licensing will deprive them of funds upon which they depend to support their own fisheries research and management programs. It is proposed that the interstate commissions should retain their identities as State-funded and St governed entities. (See also W76-09329) (Au Wisconsin)
W76-13107

STATE-FEDERAL MANAGEMENT PLANN FOR MARINE FISHERIES: TODAY A TOMORROW,
National Marine Fisheries Service, Washing D.C. Fisheries Management Div.
R. H. Schaefer.
In: Coastal Plains Center for Marine Develop Service 'Report of the Conference on Ma Resources of the Coastal Plains States', Decem 11-12, 1975, Savannah, Ga., p 69-72.

Descriptors: *Marine fisheries, *State juris tion, *Federal jurisdiction, Management, Gov mental interrelations, Planning, Regulation, stitutions.
Identifiers: 200-mile fishery zone, 3-mile territ sea.

The State-Federal Fisheries Management Prog (SFFMP) is designed to effect the rati management of domestic inter-jurisdictional fi ries by developing and implementing compre sive management plans and to promulgate leg tion. HR 200 and S. 961, each provides for a mile U.S. fisheries zone, and for the exercis Federal management authority within that z While HR 200 provides for Federal preemp under certain circumstances, neither piece legislation would diminish existing State fish management authority within the 3-mile territ sea. This legislation would also provide a spe base for the SFFMP for the management marine fisheries within the zone of extended risdiction. Both bills envision the establishme seven Regional Marine Fisheries Councils. C cil geographical configuration and composition ries between the two bills, both by representa and by numbers of members. The Councils identify those fisheries in need of conserva and management as a manageable unit, such species, stock, geographical grouping, etc. Senate bill also mentions the need for a Counc develop an area management plan with sepa programs for each fishery within its area. Co plans and proposed regulations would be revie by the Secretary of Commerce for modifica and implementation, subject to a public hearin the Senate version, an independent Fis Management Review Board is proposed to appeals on regulations instituted by the Secre (See also W76-09329) (Auen-Wisconsin)
W76-13108

6F. Nonstructural Alternatives

FLOOD PLAIN INFORMATION, LOWER FALO CREEK AND ITS TRIBUTAR NAHUNTA AND BRANTLEY COUNTY, GE GIA.
Army Engineer District, Savannah, Ga.
For primary bibliographic entry see Field 4A.
W76-13045

FLOOD PLAIN INFORMATION: SCIOTO OLENTANGY RIVERS, OHIO, CHILLICO AREA SUMMARY REPORT,
Army Engineer District, Huntington, W. Va.
For primary bibliographic entry see Field 4A.
W76-13046

FLOOD PLAIN INFORMATION: VERDIG FALL AND ELK RIVERS, KANSAS.
Army Engineer District, Tulsa, Okla.
For primary bibliographic entry see Field 4A.
W76-13047

OD HAZARD ANALYSES: ROYAL RIVER CHANDLER BROOK, TOWN OF NORTH MOUTH, MAINE.
onservation Service, Washington, D.C.
imary bibliographic entry see Field 4A.
3053

DEVELOPMENT CRITERIA OF THE IMINARY COASTAL PLAN,
rsity of Southern California, Los Angeles.
l of Public Administration.
imary bibliographic entry see Field 2L.
3092

BAY NATIONAL WILDLIFE REFUGE. PARALLELS IN IMPLEMENTING THE TAL ZONE MANAGEMENT ACT,
Bay National Wildlife Refuge, Virginia
, Va.
mary bibliographic entry see Field 6E.
3105

NG THE BEACHES: IS IT POSSIBLE,
of Outdoor Recreation, Atlanta, Ga.
ast Regional Office.
mary bibliographic entry see Field 6E.
3106

Ecologic Impact Of ater Development

RRENCE, VIABILITY AND SIGANCE OF RESTING EGGS OF THE OID COPEPOD LABIDOCERA VA,
Hole Oceanographic Institution, Mass.
rice, and V. R. Gibson.
Biology, Vol. 31, p 335-337, 1975, 2 tab, 3
SA GA-43126.

tors: Ecology, *Overwintering sites, Sedi-Eggs, *Copepods, Plankton.
ers: *Labidocera aestiva.

ory and field observations showed that L. aestiva remain viable for temperatures periods comparable to those encountered in the sediment. The existence of resting ottom sediment was demonstrated by the of L. aestiva in incubated sediment col- winter. Eggs kept for 6 months in jars during May when water temperatures to 14 degrees C. It was concluded that ggs serve as a means to overwinter the nd as a mechanism to repopulate an area species. (Chilton-ORNL)
37

NED EFFECTS ON THE ENVIRONOF RADIOACTIVE, CHEMICAL AND AL RELEASES FROM THE NUCLEAR RY, (REPORT ON THE INTERNA- SYMPOSIUM HELD IN STOCKHOLM , 1975),
nal Atomic Energy Agency, Vienna
Div. of Nuclear Safety and Environmention.
ry bibliographic entry see Field 5C.
5

UERO BAY ENVIRONMENTAL STU-
co Nuclear Center, Mayaguez.
d, M. J. Youngbluth, M. E. Nutt, P.
, and M. J. Canoy.
from the National Technical Informace, Springfield, VA 22161, as PRNC 181, aper copy, $3.00 in microfiche. Report , April 1975, 227 p, 89 ref, 32 fig, 22 tab, AT(40-1)-1833.

Descriptors: *Data collections, *Sites, Powerplants, Geologic investigations, On-site investigations, Ecology, *Puerto Rico, Physical properties, Chemical properties, Bays, Zooplankton, Invertebrates, Fish.
Identifiers: *Tortuguero Bay(PR).

Tortuguero Bay is one of seven coastal sites on which physical, chemical, and geological parameters have been studied. Ecological parameters of zooplankton, benthic invertebrates and fish communities, and plant associations were also studied. The purpose of the studies was to gather data which would be useful in the assessment of the desirability and practicability of locating power generating plants on one or more of the sites. (Chilton-ORNL)
W76-12783

SITE AND DESIGN TEMPERATURE RELATED ECONOMICS OF NUCLEAR POWER PLANTS WITH EVAPORATIVE AND NON-EVAPORATIVE COOLING TOWER SYSTEMS,
Gilbert Associates, Inc. Reading, Pa.
J. F. Sebald.
Report C00-2392-1, January 1976, 419 p, 37 fig, 137 tab, 4 ref. E(11-1) 2392.

Descriptors: *Cost analysis, *Design, *Temperature, *Sites, Economics, Nuclear powerplants, *Cooling towers, *Lake Michigan, Great Lakes, Evaporators.

The study was planned to include a wide range of plant design temperatures, develop cost elements suitable for the adjustment of differences in site, time, and location, and to develop cost sensitivity criteria such that the mass of cost data produced may be extended to include plants sited most anywhere in the United States. Two sites were selected for the study, each having characteristics which require special consideration. It was concluded that plants with evaporative cooling tower systems are economically preferable to equivalent plants using non-evaporative cooling tower systems. The cost data developed for plants with evaporative cooling systems showed that, for equivalent plants, the cost differences between natural draft and mechanical draft cooling tower systems were small, on the order of 0.5 to 0.8%. (Chilton-ORNL)
W76-12784

HABITAT EVALUATION PROCEDURES.
Fish and Wildlife Service, Washington, D.C., Div. of Ecological Services.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 254, $4.00 in paper copy, $3.00 in microfiche. July 1, 1976, 30 p.

Descriptors: *Water resources development, *On-site investigations, *Carrying capacity, *Habitats, *Analytical techniques, *Evaluation, Ecology, Economics, Projects, Costs, Benefits, *Project planning, Annual equivalent costs, Annual equivalent benefits, *Wildlife, Hunting, *Fishing, Edge effect, *Aquatic habitats, *Terrestrial habitats, Wetlands, U.S. Water Resources Council, Wildlife management.
Identifiers: Principles and Standards for Planning, National Environmental Policy Act(NEPA), Fish and Wildlife Coordination Act.

Habitat evaluation procedures were developed as a uniform, nationwide method for determining impacts on fish and wildlife and their habitat, arising from water and related land resource development projects. The procedures are divided into two main parts, one which measures the ability of the habitat to sustain fish and wildlife, and the other to measure the level of hunting and fishing which the habitat can sustain and still replenish itself from year to year. For each procedure, the quality of the habitat is measured either in ecological or economic terms, then the losses or gains estimated to be sustained with the construction of a water or related land resource development project are calculated and annualized over the life of the project. Provision is made to compare several alternative plans for the area in term of habitat units for the ecological section, and in dollars for the economic section. An additional feature of the ecological section of the procedure involves estimating the increase in carrying capacity which can be attained with wildlife management. This value is then used to calculate the amount of habitat needed to compensate for wildlife losses attributable to the installation of the project. (Winters-FWS)
W76-12845

THE ENVIRONMENTAL IMPACT OF WATER CHLORINATION.
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 5C.
W76-12876

SOME ECOLOGICAL ASPECTS OF THE CABORA BASSA DAM,
Rhodes Univ., Grahamstown (South Africa). Inst for Freshwater Studies.
B. R. Davies, A. Hall, and P. B. N. Jackson.
Biological Conservation, Vol. 8, No. 3, p 189-201, 1975. 1 fig, 25 ref.

Descriptors: *Environmental effects, *Dams, *Africa, *Reservoirs, Electric power production, Productivity, Sediment transport, Deltas, Tropic, Aquatic weed control, Social aspects, Biocontrol, Insects, Floating plants, Vectors(Biological), Fish, Fisheries, Economic impact, Water pollution control, Recreation, Human population, Conservation, Wildlife management, Industries.
Identifiers: *Cabora Bassa Dam(Mozambique), Zambezi River(Mozambique), Paulina acuminata, Neochetina eichhorniae.

The lake resulting from the Cabora Bassa Dam on the Middle Zambezi in Mozambique, South Africa, is expected to eventually produce 3870 mw of electricity by September 1975. The potential of the region is enormous. At first the lake will have a large nutrient increase; initially this may be slowed by production of reducing substances such as hydrogen sulfide. The lake will tend towards oligotrophy. Invasion by aquatic macrophytes will be a problem. Mechanical and herbicidal removal is not feasible, but biological control is being considered. As nutrient levels stabilize, weed infestations should decrease. Floating weeds conserve major nutrients and provide shelter for fish fry. Draw-down for weed control would reduce marginal hydrophyte development. Fish will initially be species present in the river. Floating aquatic macrophytes and uncleared bush may make fishing difficult at first but a pelagic fishery shows promise. Possible ecological effects of the lake on wildlife in the area and downstream are discussed. Public health problems may arise; and the effects of resettlement of a 25,000 population are evaluated pro and con. Conservation measures are proposed with regard to recreational facilities, game reserves, and heavy industry. (Buchanan-Davidson--Wisconsin)
W76-12945

THE SOCIAL AND ECONOMIC IMPORTANCE OF THE CARONI SWAMP IN TRINIDAD AND TABAGO,
Michigan Univ., Ann Arbor. Dept. of Natural Resources.
B. S. Ramdial.
Available from the National Technical Information Service, Springfield, VA 22161 as COM 75-10846, $9.00 in paper copy, $3.00 in microfiche. PhD theiss, 1975. 266 p. 24 fig., 9 tab., 73 ref., 9 append.

Descriptors: *Natural resources, *Conservation, *Resource allocation, Economic rent, Land use, Social values, Recreation, Tourism, Land use, Na-

tional parks, *Mangrove swamps, Estuaries, Fisheries, Statistical methods, Aesthetics, Employment, Benefits, Comprehensive planning, Management, Bird types, *Swamps.
Identifiers: *Caroni Swamp(Trinidad/Tobago).

The threat of development and land use patterns to Trinidad and Togago's outstanding Caroni Swamp engendered this social and economic study to determine its benefits. Non-priced recreational benefits, estimated by the travel-cost method, indicate that the Swamp resources are valued at $1,038,500, with the addition of employment for 240 full-time and 105 part-time persons. The fin and shellfish harvest is valued at $981,450 and based on a total annual return of $2,020,020 calculates the present worth at $4,000/acre. The opportunity cost is estimated at $1,398,330 and the social cost at $2,625,000, excluding multiplier effects and demand projections. The weakness of using the market system to guide public policy is discussed. Alternative measures for conflict situations and potential areas for development are described. In the absence of a competent central authority with clear, social, economic, and legal guidelines within which to operate, the intrinsic values of the Swamp are progressively deteriorating, conflict situations are growing and unfettered developmental pressures are mounting. It is recommended that this estuarine Swamp be declared a national park to preserve its employment opportunities, the large quantities of protein produced, the fish and wildlife supported, the educational opportunities available, the aesthetics, the coastal storm buffer, and its function in the abatement of inland flood waters. (Auen-Wisconsin)
W76-12952

ENVIRONMENT AND SOCIAL CLASS, EESG BIBLIOGRAPHY SERIES 15.
Bristol Univ. (England). Dept. of Economics.
For primary bibliographic entry see Field 6B.
W76-12962

WISCONSIN ANNUAL REPORT 1975,
Upper Great Lakes Regional Commission, Madison, Wis.
For primary bibliographic entry see Field 6B.
W76-12964

ENERGY DEVELOPMENT: THE ENVIRONMENTAL TRADEOFFS. VOLUME 3: RELATIVE ENVIRONMENTAL RANKING OF PROPOSED OFFSHORE CONTINENTAL SHELF AREAS ON THE BASIS OF IMPACTS OF OIL SPILLS,
Stanford Research Inst., Menlo Park, Calif.
P. J. Kinney, P. D. Carpenter, M. D. Levine, and S. H. Traver.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-250 002, $4.50 in paper copy, $3.00 in microfiche. Prepared for the Office of Planning and Evaluation, U.S. Environmental Protection Agency, Washington, D.C., September 1975. 61 p, 14 fig, 10 tab, 40 ref. 68-01-2469.

Descriptors: Aquatic habitats, Ecosystems, *Trophic level, *Aquatic environment, *Oil spills, *Oil pollution, *Oil wells, Phytoplankton, Zooplankton, Fish, *Marine animals, Birds, *Atlantic Ocean, *Continental Shelf, *Benthos, *Biota, Alaska.
Identifiers: Benthic biotic, Shore-related biota, North Atlantic Ocean, *South Atlantic Ocean, *Mid-Atlantic Ocean, *Santa Barbara Channel, *South of Channel Islands, *Gulf of Alaska, *Bristol Bay(AK), *Beaufort Sea(AK), *Cook Inlet(AK), *Kotzebue Sound(AK).

Ten offshore regions, North Atlantic, Mid-Atlantic, South Atlantic, Southern California including Santa Barbara Channel and South of Channel Islands, the Gulf of Alaska, Bristol Bay, Beaufort Sea, Cook Inlet, and Kotzebue Sound were studied to determine the risks associated with oil drilling in the offshore continental shelf (OCS). Only the impact of oil spills were studied, and did not include impacts of man's activities in wilderness areas or the impact of changes, i.e., absorption of the sun's radiant energy due to oil on pack ice. The offshore regions were factored into ecological components based upon trophic levels and habitats. The components were phytoplankton, zooplankton, benthic biotic, shore-related biota, fish, marine mammals and birds. Biological and physical data were used to measure relative sensitivity of each ecological component to damage by oil; relative biological abundance; relative probabilities of major portions of the ecological component coming into contact with oil from a spill; and relative probabilities of a spill occurring. Each factor was evaluated on a 1 to 7 scale of increasing effect. Conclusions were that the least affected ecological areas would be the North Atlantic, Mid-Atlantic and Kotzebue Sound (AK); intermediate damage would occur in the South Atlantic, Beaufort Sea (AK), South of the Channel Islands and the Santa Barbara Channel; heavy damage is likely in Bristol Bay (AK), Cook Inlet (AK) and the Gulf of Alaska. (Gentry-NC)
W76-13039

A PROPOSED METHODOLOGY FOR ASSESSING ALTERNATIVE TECHNOLOGIES,
Cornell Univ., Ithaca, N. Y. Program on Science, Technology and Society.
P. L. Bereano, J. Callen, W. B. Kellner, G. R. Olson, and B. H. Wengenroth.
Technology Assessment, Vol. 1, No. 3, p. 179-190. 6 fig, 20 ref.

Descriptors: *Methodology, *Decision-making, *Planning, *Technology, *Environmental effect, Environmental control, Probability, Alternate planning, *Evaluation.
Identifiers: Effects chain, Effects matrix, *Alaska pipeline.

A matrix methodology for decision-making which could be used to assess technological developments is proposed and applied to the case of the Alaska pipeline. The proposed methodology draws on past work by J. C. Sorenson, Luna Leopold, I. D. J. Bross and two groups at Cornell University, the first 2 theories are analytical matrix methodologies and the third is an individual planning process. The matrices related actions which cause environmental impact with existing conditions and characteristics of the environment. Bross developed a prediction system wherein probabilities are assigned to various outcomes producing a numerical value which can be used to make decisions, and also involves a value system in which a value indicating the desirability of an outcome is assigned to each outcome. This report utilizes a matrix scheme which arrays the action alternatives on one axis and variables or parameters on the other axis. To identify appropriate parameters, and effects chain was developed as a visual technique to generate and display all parameters or effects associated with actions taken. The effects chain suggests causal relationships with parameters being the endpoints of the chain. An effects matrix lists intersections between parameters and techniques, thus serving as a helpful guide in the decision-making process. The next stage in developing a rational decision-making methodology would be to assign probabilities, utilities and importance to the outcomes described in the effects matrix. Public participation in decision-making may be enhanced by separating technical analysis from value weights and by forcing the disaggregation of complex systems. (Gentry-North Carolina)
W76-13049

DEVELOPMENT OF RESIDUALS MANAGEMENT STRATEGIES: AN EXECUTIVE SUMMARY,
Indiana Univ., Bloomington. School of Public and Environmental Affairs.
For primary bibliographic entry see Field 5G.
W76-13054

A PRELIMINARY ASSESSMENT OF THE ENVIRONMENTAL VULNERABILITY O MACHIAS BAY, MAINE TO OIL SUPERTAN KERS,
Massachusetts Inst. of Tech., Cambridge
S. F. Moore, R. L. Dwyer, and A. M. Katz.
Available from the National Technical Informa tion Service, Springfield, VA 22161 as COM-7 10564, $6.75 in paper copy, $3.00 in microfich Sea Grant Report No. MITSG-73-6, Index No. 7 306-Cwm, January 15, 1973. 171 p, 136 ref.

Descriptors: *Maine, *Oil pollution, *Oil spill *Environmental effects, *Resources develo ment, *Water pollution, Water resources, Tran portation, Dispersion, Coasts, Beaches, Aquat animals, Aquatic plants, Ports, Ecology.
Identifiers: *Outer Continental Shelf, *Oil sp trajectories, Supertankers, Tanker terminals, Si survey, Environmental impact, *Machi Bay(Maine).

The environmental vulnerability of Machias Ba Maine to a proposed oil supertanker terminal w studied by means of a review and interpretation the literature. A possible framework is propose for assessing impacts of environmental change Processes considered are transport and dispersio biological transfers and modifications, and biolog cal effects. Separate consideration is given to description of existing conditions along the easte coast of Maine, the composition and chara teristics of crude petroleum and petroleu products, the effects of oil on marine organism potential spill trajectories and behavior, an finally an assessment is made of the environment vulnerability. (Sinha-OEIS)
W76-13087

THE POTENTIAL EFFECTS OF INCREASIN OIL TANKER SIZE ON NARRAGANSETT BA AN ADVISORY REPORT TO THE COASTA RESOURCES MANAGEMENT COUNCIL.
Rhode Island Statewide Planning Progra Providence.
Available from the National Technical Inform tion Service, Springfield, VA 22161 as PB-212 91 $4.00 in paper copy, $3.00 in microfiche. Technic Paper No. 24, July 1972. 26 p, 2 fig, 4 tab, 30 ref.

Descriptors: *Rhode Island, *Environmental e fects, *Water pollution effects, *Resourc development, *Transportation, Leakag Hazards, Damages, Accidents, Pollution, Wat resources, Oil industry.
Identifiers: *Outer Continental She *Narragansett Bay(RI), Oil tankers, Supertanker Collisions.

The possible ramifications of the growth of t world tanker fleet, both in size and in number and this growth's subsequent effect on Narraga sett Bay is outlined. The report examines bo ship-to-ship and ship-to-shore offloading and t possible pollution effects of these techniques. T three main causes of pollution - bilge pumpin transfer leakage and collisions - are also co sidered in terms of a future increase in tanker tra fic on the Bay. (Sinha-OEIS)
W76-13088

POSSIBLE EFFECTS OF CONSTRUCTION AN OPERATION OF A SUPERTANKER TE MINAL ON THE MARINE ENVIRONMENT THE NEW YORK BIGHT,
State Univ. of New York at Stony Brook. Mari Sciences Research Center.
J. L. McHugh, J. J. Ginter, W. E. Knapp, A. L. Tsao, and M. D. Greenfield.
Available from the National Technical Inform tion Service, Springfield, VA 22161 as PB-219 64 $7.75 in paper copy, $3.00 in microfiche. Sea Gra Report, November 1972. 223 p, 55 fig.

U.S. DEPT. OF COMMERCE
NATIONAL TECHNICAL INFORMATION SERVICE
SPRINGFIELD, VA 22161

ɔtors: *Continental Shelf, *Water pollution
, *Environmental effects, *Oil spills, *Oil
on, *Resources development, *Waste
l, New York, Bays, Oceans, Ports, Trans-
on, Hazards, Damages, Accidents,
g, Spoil banks.
ers: *Outer Continental Shelf, *New York
*Tanker terminals, *Supertankers, Deep-
orts, Coastal zone, Environmental impact.

uation of the environmental impact of con-
n and operation of a supertanker terminal
lew York Bight area considers the effects
ging and spoil disposition, vessel move-
chronic low-level oily discharges, and ac-
spills. Three possiole sites are studied and
construction alternatives are included. If
leakage or accidental spills can be con-
r cleaned up quickly, then the environmen-
equences of operating a deepwater ter-
t either of the offshore sites probably
e acceptable. The risk to the coastal zone
nent decreases with increasing distance
ore. Therefore it was recommended that if
ded to construct a supertanker terminal in
rk Bight it should be placed as far offshore
cal. (Sinha-OEIS)
89

RE IMPACTS OF OIL AND GAS
OPMENT IN ALASKA, VOLUME I.
e Planning Associates, Inc., Cambridge,

ary bibliographic entry see Field 5G.
00

RE IMPACTS OF OIL AND GAS
OPMENT IN ALASKA. VOLUME II.
OLOGY APPENDICES.
Planning Associates, Cambridge, Mass.
ary bibliographic entry see Field 5G.
01

ASTAL PLAINS REGIONAL COMMIS-
S. GEOLOGICAL SURVEY.
AGNETIC-AERORADIOACTIVITY

l Survey, Reston, Va.
ry bibliographic entry see Field 7B.
9

OURCES DATA

twork Design

OLOGY FOR THE SELECTION AND
TION OF PROBABILITY MODELS
SIMULATION OF DAILY RAINFALL
OFF,
niv., West Lafayette, Ind. School of
neering.
vas, and J. W. Delleur.
al Sciences Bulletin, Vol. 21, No. 1, p
rch 1976. 11 fig, 3 tab, 18 ref. OWRT B-
).

s: *Rainfall, *Runoff, *Model studies,
ogy, Graphical analysis, Probability,
Automation, Simulation analysis,
cal studies, Environment, Equations,
Statistical methods, Statistics.
*Probability models, *Climatological
t, Computer-oriented procedure,
analysis, Hydrological point process,
ed data, Spectral density, Variance-
astic models.

ic, computer-oriented procedure was
o avoid the problems of selecting the
probability model for a particular cli-
environment and of using it for opera-
ses. The procedure avoided subjectivi-
ty in the selection of the model and eased the labor in the successful selection and application of the stochastic model underlying the particular hydrological phenomenon. The methodology for the statistical analysis of series of events by Cox and Lewis (1966) was extended and applied to hydrology for the analysis of daily rainfall sequences. The hydrological point process had time trends and cyclicity. A procedure for the detection and calibration of these time trends and cyclicities was developed on the basis of which a homogenization program was produced. Statistical tests could be performed on the homogenized data. A method of statistical analysis utilizing the rate of occurrence function, the spectrum of counts, the variance-time of counts, the spectral density, the autocorrelation function, and the log-survior function of the interarrival times was applied to the homogenized data to select a model that suited the behavior of these functions and passed the statistical tests. Several of these functions were tabulated for some point stochastic models. (Roberts-ISWS)
W76-12994

7B. Data Acquisition

STUDIES ON THE POTENTIAL EVAPORATION OF LAWNS UNDER DIFFERENT CONDITIONS OF UNDERGROUND WATER: A COMPARISON OF CALCULATED VALUES WITH THE VALUES OF A LYSIMETER, (IN GERMAN),
Technische Universitaet, Hanover (West Germany). Institut fuer Meteorologie und Klimatologie.
For primary bibliographic entry see Field 2D.
W76-12757

NEARSHORE CURRENTS AT POINT BEACH, WISCONSIN (1974-1975),
Argonne National Lab., Ill.
K. D. Saunders, L. Van Loon, C. Tome, and W. Harrison.
Available from the National Technical Information Service, Springfield, VA 22161 as ANL/WR-76-1, $9.00 in paper copy, $3.00 in microfiche. Report ANL/WR-76-1, March 1976, 252 p, 42 fig, 10 tab, 23 ref, 3 append. W-31-109-Eng-38.

Descriptors: *Data collections, *Currents(Water), On-site investigations, Winds, Forecasting, Great Lakes, *Wisconsin, *Lake Michigan, *Lake shores.

The goals of this research effort were to obtain an expanded data base for nearshore currents and winds in the vicinity of Point Beach, to determine the mechanisms governing the nearshore currents, to develop a predictive capability for determining the nearshore currents and to improve understanding of the processes of dispersion in the nearshore regime. Currents were monitored at stations 0.4, 1.1, and 3.8 km from shore. Graphs for the current and wind observation are presented which depict (1) U, V flow components versus time, (2) specific kinetic energy versus time, (3) flow speeds and directions versus time, (4) composite velocity histograms and associated U, V-component histograms, and (5) progressive vector diagrams. Optimal linear filtering techniques were used in prediction of nearshore currents. (Chilton-ORNL)
W76-12758

TEMPERATURE RESPONSES OF A COCCOLITHOPHORID, CRICOSPHAERA CARTERAE, MEASURED IN A SIMPLE AND INEXPENSIVE THERMAL-GRADIENT DEVICE,
Duke Univ., Beaufort, N.C. Marine Lab.
For primary bibliographic entry see Field 5A.
W76-12764

A COMPARISON OF AERIAL INFRARED AND BOAT ORIENTED THERMAL PLUME MEASUREMENT TECHNIQUES,
Argonne National Lab., Ill.
For primary bibliographic entry see Field 5B.
W76-12773

MEASUREMENT AND EVALUATION METHODS FOR THE DETERMINATION OF THE UNSATURATED HYDRAULIC CONDUCTIVITY OF SOILS IN SITU, (IN GERMAN).
For primary bibliographic entry see Field 2G.
W76-12799

QUANTITATIVE RELATIONSHIP BETWEEN REFLECTANCE AND TRANSPIRATION OF PHREATOPHYTES--GILA RIVER TEST SITE,
Geological Survey, Tucson, Ariz.
For primary bibliographic entry see Field 2D.
W76-12802

INVESTIGATIONS CONCERNING MAPPING AND CLASSIFYING OF MARSH SOILS, (IN GERMAN),
Kiel Univ. (West Germany). Geologisch-Palaeontologisches Institut und Museum.
For primary bibliographic entry see Field 2G.
W76-12814

REMOTE SENSING STUDY OF MAUMEE RIVER EFFECTS ON LAKE ERIE,
National Aeronautics and Space Administration, Cleveland, Ohio. Lewis Research Center.
For primary bibliographic entry see Field 5A.
W76-12819

A CONDUCTIVITY FLOW METER,
Department of Scientific and Industrial Research, Taupo (New Zealand). Ecology Div.; and Department of Scientific and Industrial Research, Taupo (New Zealand). Freshwater Section.
P. H. John, F. A. Johnson, and P. Sutcliffe.
Journal of Hydraulic Research, Vol. 14, No. 1, p 37-44, 1976. 6 fig, 1 tab, 6 ref.

Descriptors: *Flow measurement, *Flow rates, *Flow, *Instrumentation, Conductivity, Equipment, Laboratory tests, Velocity, Salinity, Turbulence, Sediment control.
Identifiers: *Conductivity flow meter, Salt velocity method, Time of travel, Flow meters, Mean velocity.

The Conductivity Flow Meter (CFM) was shown to be a useful modification to existing salt velocity methods of flow measurement. This preliminary work clearly demonstrated the practicability of the CFM. Future work is aimed toward determining the range of application of the method and developing a set of operator guidelines for establishing geometric requirements of locating equipment in different channels. The figures demonstrated that the CFM is an acceptable alternative to the conventional current meter for measuring flow velocities. (Morris-ISWS)
W76-12825

TECHNIQUES FOR OPTIMIZING A QUADRUPOLE GC/MS/COMPUTER SYSTEM,
Environmental Research Lab., Athens, Ga.
For primary bibliographic entry see Field 5A.
W76-12870

RECOMMENDED DESIGN OF SAMPLE INTAKE SYSTEMS FOR AUTOMATIC INSTRUMENTATION,
Environmental Monitoring and Support Lab., Cincinnati, Ohio.
For primary bibliographic entry see Field 5A.
W76-12871

INSTRUMENTATION AND AUTOMATION OF WASTEWATER COLLECTION AND TREATMENT SYSTEMS, (LITERATURE REVIEW),
Municipal Environmental Research Lab., Cincinnati, Ohio.
For primary bibliographic entry see Field 5D.
W76-12901

CONTINUOUS MONITORING, AUTOMATED ANALYSIS, AND SAMPLING PROCEDURES, (LITERATURE REVIEW),
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
For primary bibliographic entry see Field 5A.
W76-12902

ULTRASONIC REMOVAL OF EPILITHIC ALGAE IN A BARCLAMP SAMPLER,
Ichthyological Associates, Inc., Berwick Pa.
For primary bibliographic entry see Field 5A.
W76-12939

AN AUTOMATED ASSAY FOR THE DETERMINATION OF NITRATE REDUCTASE IN MARINE PHYTOPLANKTON,
Centre Universitaire de Luminy, Marseille (France). Laboratoire d'Oceanographie.
For primary bibliographic entry see Field 5C.
W76-12940

NEW DIVER-OPERATED BEDLOAD SAMPLER,
Georgia Inst. of Tech., Atlanta. Dept. of Geophysical Science.
For primary bibliographic entry see Field 2J.
W76-12972

CLASSIFICATION AND ANALYSIS OF RIVER PROCESSES,
For primary bibliographic entry see Field 8B.
W76-12973

A GUIDE TO METHODS AND STANDARDS FOR THE MEASUREMENT OF WATER FLOW,
National Bureau of Standards, Washington, D.C., Inst. for Basic Standards.
For primary bibliographic entry see Field 8B.
W76-13000

PORTABLE, ADJUSTABLE FLOW-MEASURING FLUME FOR SMALL CANALS,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
For primary bibliographic entry see Field 4A.
W76-13007

SHIPBOARD OIL-IN-WATER CONTENT MONITOR BASED ON SMALL ANGLE FORWARD LIGHT SCATTERING,
General Electric Co., Philadelphia, Pa. Re-entry and Environmental Systems Div.
For primary bibliographic entry see Field 5G.
W76-13094

THE COASTAL PLAINS REGIONAL COMMISSION--U.S. GEOLOGICAL SURVEY. AEROMAGNETIC-AERORADIOACTIVITY SURVEY,
Geological Survey, Reston, Va.
I. Zietz.
In: Coastal Plains Center for Marine Development Services 'Report of the Conference on Marine Resources of the Coastal Plains States', December 11-12, 1975, Savannah, Ga., p 5-8.

Descriptors: *Coastal plains, *Surveys, *Oil, *Metals, North Carolina, South Carolina, Georgia, Methodology, Geologic formations, *Radioactivity techniques, *Electromagnetic waves, *Remote sensing.
Identifiers: *Aeromagnetic survey, *Aeroradioactivity survey, Ores, Minerals.

The Coastal Plains Regional Commission expended $100,000 for surveys of North and South Carolina and Georgia to determine the potential of ore and oil deposits in this region. An aircraft, equipped with a magnetometer, flew continuous lines at a 500-ft altitude with a flight separation of one mile. A radioactivity survey was conducted jointly with the gamma measurements. Contours were compiled from the data and then digitized and transferred to magnetic tape for ready access. The radioactivity survey portion of the effort showed that there are three major monazite belts, paralleling the Piedmont and extending from Alabama to Virginia. Monazite is associated with titanium. The largest radioactivity anomalies were found along the Altamaha River. Chemical measurements of grab samples and two drillholes were used to determine the thickness of the deposit. The initial results of the investigations suggest that one deposit may be worth as much as $1.5 billion. The total value of the combined six deposits in that vicinity are estimated to be as much as $6 billion. The survey methods, as related to geology, are explained. (See also W76-09329) (Auen-Wisconsin)
W76-13099

THE CONTINUOUS ALUMINUM-FOIL HYDROMETEOR SAMPLER; DESIGN, OPERATION, DATA ANALYSIS PRECEDURES, AND OPERATING INSTRUCTIONS,
Air Force Cambridge Research Labs., Hanscom AFB, Mass.
For primary bibliographic entry see Field 2B.
W76-13173

AN ERTS-1 STUDY OF COASTAL FEATURES ON THE NORTH CAROLINA COAST,
Coastal Engineering Research Center, Fort Belvoir, Va.
G. H. Miller, and D. W. Berg.
Available from the National Technical Information Service, Springfield, Va 22161 as ADA-022 336, $4.00 in paper copy, $3.00 in microfiche. Miscellaneous Report No. 76-2, January 1976. 41 p, 12 fig, 5 tab, 14 ref.

Descriptors: *Remote sensing, *Coasts, *Estuaries, *North Carolina, *Atlantic Ocean, Rivers, Inlets(Waterways), Shallow water, Satellites(Artificial), Sand bars, Beaches, Suspended solids, Sediments, Coastal marshes, Oceans.
Identifiers: *ERTS.

Unenhanced imagery recorded by the multispectral scanner (MSS) of the NASA Earth Resources Technology Satellite (ERTS-1) was analyzed to determine how satellite imagery may be applied to specific coastal engineering problems. The study area was a segment of the North Carolina coast comprising Wrightsville Beach, Masonboro Inlet, Masonboro Beach, Carolina Beach Inlet, and Carolina Beach, which are areas of ongoing research by CERC. Analysis was supplemented by underflight imagery supplied by NASA and ground-truth data. Several significant coastal features were visible in the ERTS-1 imagery. Among those were plumes of suspended sediment emerging from inlets, changes in water coloration possibly due to effects of temperature change, inlet bars, and cape bars. In addition, morphological changes in selected coastal land features were determined by comparing ERTS-1 films obtained about 1 year apart. Limited water depth penetration was afforded by examining the lower MSS spectral bands. It was learned that maximum penetration can be expected to measure in tens of feet, depending on the physical characteristics of ocean water. Although inadequate for deeper penetration, this capability is adequate for exposure of backshore and nearshore underwater features. Image resolution capability is sufficient for observation of gross coastal features and processes but may not be adequate for viewing smaller features such as wave patter morphological features on beaches, and many gineering structures. (Sims - ISWS)
W76-13174

SPECTRAL REFLECTANCE AND RADIAN CHARACTERISTICS OF WATER POLL TANTS,
Environmental Research Inst., of Michigan, Arbor. Infrared and Optics Div.
For primary bibliographic entry see Field 5A.
W76-13176

RESULTS OF SOIL MOISTURE FLIGHTS D ING APRIL 1974,
National Aeronautics and Space Administrati Greenbelt, Md. Goddard Space Flight Center.
For primary bibliographic entry see Field 2G.
W76-13178

AN ANALYSIS OF THE ERRORS ASSOCIAT WITH THE DETERMINATION OF MOSPHERIC TEMPERATURE FROM MOSPHERIC PRESSURE AND DENSITY DA
National Aeronautics and Space Administrat Greenbelt, Md. Goddard Space Flight Center.
For primary bibliographic entry see Field 2B.
W76-13179

BROADBAND SPECTRAL PHOTOGRAPHY THE JAMES RIVER,
National Aeronautics and Space Administrat Langley Station, Va. Langley Research Center
For primary bibliographic entry see Field 5A.
W76-13180

THE FEASIBILITY OF OIL-POLLUTION TECTION AND MONITORING FROM SPA EXAMPLES USING ERTS-1 AND SKY DATA,
Environmental Research Inst., of Michigan, Arbor. Infrared and Optics Div.
For primary bibliographic entry see Field 5A.
W76-13181

BASIC INVESTIGATIONS FOR REM SENSING OF COASTAL AREAS,
Environmental Research Inst. of Michigan, Arbor. Resources and Technology Div.
For primary bibliographic entry see Field 2L.
W76-13182

BASIC INVESTIGATIONS FOR REM SENSING OF COASTAL AREAS,
Environmental Research Inst. of Michigan, Arbor. Resources and Technology Div.
For primary bibliographic entry see Field 2L.
W76-13183

APPLICATIONS OF REMOTE SENSING ESTUARINE PROBLEMS,
Virginia Inst. of Marine Science, Gloucester P
For primary bibliographic entry see Field 2L.
W76-13184

INTERDISCIPLINARY APPLICATIONS INTERPRETATION OF EREP DATA WI THE SUSQUEHANNA RIVER BASIN,
Pennsylvania State Univ., University Park. C for Remote Sensing of Earth Resources.
G. J. McMurtry, and G. W. Petersen.
Available from the National Technical Inf tion Service, Springfield, VA 22161 as N75-2 $3.50 in paper copy, $3.00 in microfiche. Qua Progress Report, December 1974-February 15 p. NASA NAS9-13406.

Descriptors: *Remote sensing, *Data proce Resources, *Pennsylvania, *Resources dev

, Geology, Mining, Lead, Zinc, Frac- (Geologic), Groundwater, Photography, puter programs, Acid mine water, Projects. ifiers: *ERTS, *SKYLAB, Lineaments, interpretation, *Susquehanna River basin.

nt research activities of the SKYLAB EREP tigation were described. The following activi- ere mentioned: It has become evident that nents seen on SKYLAB and ERTS images t equally well defined, and that the clarity of tion of a particular lineament is recorded what differently by different interpreters. In ort to determine the extent of these varia- a semiquantitative classification scheme has devised. Lineament detections on SKYLAB RTS scenes are also being compared, with jective of determining if the same features en on both sets of data and to what extent ecision of determination differs for the two ets. Research has been continuing in the ication of ground evidence for lineaments eir usefulness in prospecting for lead-zinc ts. In the study of the applications of linea- to groundwater and geologic engineering ms, an additional area is being considered alysis. Thermal anomalies from SKYLAB RTS scenes are being studied using both interpretative and digital processing ques. The SKYLAB data quality com- n study is progressing rapidly. The SUB- and TPINFO programs have been revised cess tapes in the SKYLAB S192 line- tened and conical formats. Processing has on the newly received SKYLAB data tapes ee Pennsylvania areas. The study of acid drainage effects in Western Pennsylvania continued, using SKYLAB digital data. SWS)
3188

Evaluation, Processing and blication

1: A COMPUTER PROGRAM FOR CAL- TING FROM EXPERIMENTAL DATA ARIATION IN HEAT TRANSFER COEF- T ROUND A CYLINDRICAL SURFACE,
Kingdom Atomic Energy Authority, Risley d). Reactor Group.
rnett.
eport 2740(W), Sub-Ref: RPC/HT/P(75)5, ig, 4 ref, 2 append.

tors: *Computer programs, Mathematical *Heat transfer.

alculations performed, the structure within ndrical surface is assumed to consist of a f concentric annuli for any one of which sical properties and volume generation of main constant. These characteristics may wever, from one annulus to another. Heat ion along the cylinder is assumed to be e, but adjustment for the localised longitu- nduction effects associated with ribbed may be included. The program is written TRAN and a version is available for the computer. (Chilton-ORNL)
87

ALUATION OF TWO HYDROGRAPH TION METHODS OF POTENTIAL USE IONAL WATER QUALITY ASSESS-

ge National Lab.,Tenn.
ary bibliographic entry see Field 5G.
91

D-WATER BASIC DATA FOR DUNN , NORTH DAKOTA.
al Survey, Bismarck, N. Dak.
using.

North Dakota County Ground-Water Studies 25--Part II, and North Dakota Geological Survey Bulletin 68--Part II, Bismarck, N. D. 1976. 501 p, 3 fig, 1 plate, 10 tab, 20 ref, 2 append.

Descriptors: *Groundwater, *Basic data collections, *North Dakota, *Water quality, *Well data, Aquifer characteristics, Geology, Observation wells, Test wells, Water levels, Drillers logs, Springs, Groundwater resources, Chemical analysis, Water chemistry.

The ground-water investigation in Dunn County, N.D., was made cooperatively by the U.S. Geological Survey, North Dakota State Water Commission, North Dakota Geological Survey, and the Dunn County Water Management District. The results of the investigation will be published in three separate parts. Part (1) is an interpretive report describing the geology of the study area; part (2) is a compilation of the ground-water basic data; and part (3) is an interpretive report describing the ground water resources. Part (2) (this report) contains basic data for 1,216 wells and test holes and 134 springs. It includes 632 logs of test holes and wells, 408 chemical analyses of water samples, and water-level measurements in 140 observation wells. The geologic formations penetrated by drilling are Upper Cretaceous, Tertiary, and Quaternary in age. (Woodard-USGS)
W76-12786

MAP SHOWING POTENTIAL SOURCES OF GRAVEL AND CRUSHED-ROCK AGGREGATE IN THE COLORADO SPRINGS-CASTLE ROCK AREA, FRONT RANGE URBAN CORRIDOR, COLORADO,
Geological Survey, Denver, Colo.
D. E. Trimble, and H. R. Fitch.
For sale by USGS Reston, Va., 22092, price $1.75.
Miscellaneous Investigations Series Map I-857-A, 1974. 1 sheet, 1 map, 1 tab, 9 ref.

Descriptors: *Fluvial sediments, *Geologic mapping, *Gravels, *Rocks, *Quarries, Mining, *Colorado, Rock mechanics, Particle size, Aggregates, Flood plains, Glaciation.
Identifiers: *Colorado Springs-Castle Rock area(Colo).

High-quality gravel in the Front Range Urban Corridor is restricted largely to areas beneath flood plains of major streams and to low terraces along these streams. Rock suitable for processing into crushed-rock aggregate is plentiful in the older rocks of the mountains, in certain volcanic rocks of the foothills and plains, and in certain limestones, mainly in the Colorado Springs area. For many years, crushed limestone has been the chief source of concrete aggregate in the Colorado Springs area. Potential sources of gravel or of aggregate have been grouped into eight map units-three of gravel and five of crushed-rock aggregate. A potential source of gravel, as here defined and mapped contains 20 percent or more of granule- and pebblesize stones (smaller than 2.5 in. or 6.4 cm but retained on a No. 10 U.S. Standard sieve). The minimum gravel content was placed arbitrarily at 20 percent of the deposit because this was estimated to be the most likely economic limit under the most adverse foreseeable conditions. The map units are based on differences in physical characteristics, which, in turn, determine relative quality for different uses. (Woodard-USGS)
W76-12787

LAND-USE CLASSIFICATION MAP OF THE COLORADO SPRINGS--CASTLE ROCK AREA, FRONT RANGE URBAN CORRIDOR, COLORADO,
Geological Survey, Denver, Colo.
L. B, Driscoll.
For sale USGS, Reston, Va., 22092, price $1.75.
Miscellaneous Investigations Series Map I-857-B, 1975. 1 sheet, 1 map, 2 ref.

Descriptors: *Land use, *Land classification, *Maps, *Urbanization, *Surface water, Land resources, Land management, Lakes, Reservoirs, *Colorado.
Identifiers: *Front Range Urban Corridor(Colo), Colorado Springs-Castle Rock area(Colo).

The Front Range Urban Corridor of Colorado, from Fort Collins on the north through Fountain on the south, is an area of rapid population growth and expanding land development. This map provides for the Colorado Springs-Castle Rock area the first step toward compatible land uses in the future--a comprehensive picture of the distribution of different land classes and an implication about the proportions of various uses. If used with maps showing resources, soil types, geology, water availabilty, topography, demography, and other attributes, this land-classification map helps to set limitations on use of the land. Once the limitations are known, zoning can help assure land uses that are compatible with the natural environment--for example, the zoning of flood plains for greenbelt or recreational use. (Woodard-USGS)
W76-12788

MAP SHOWING POTENTIAL SOURCES OF GRAVEL AND CRUSHED-ROCK AGGREGATE IN THE BOULDER-FORT COLLINS-GREELEY AREA, FRONT RANGE URBAN CORRIDOR, COLORADO,
Geological Survey, Denver, Colo.
R. B. Colton, and H. R. Fitch.
For sale by USGS, Reston Va., 22092, price $1.75.
Miscellaneous Investigations Series Map I-855-D, 1974. 1 sheet, 1 map, 1 tab, 39 ref.

Descriptors: *Fluvial sediments, *Geologic mapping, *Gravels, *Rocks, *Quarries, Mining, *Colorado, Rock mechanics, Particle size, Aggregates, Flood plains, Glaciation.
Identifiers: *Boulder-Fort Collins-Greeley area(Colo).

Deposits of high-quality gravel in the Boulder-Fort Collins-Greeley, Colo., area mostly under flood plains and terraces of major streams. Gravel and rock resources have been grouped into five map units; two are sources of gravel and three are sources of rock suitable for crushing. The map units are based not on quality judgments but on differences in physical characteristics which do determine quality which, in turn, determines suitability for different uses. Gravel deposits, as here defined and mapped, are inferred to contain at least 20-percent granule-and pebble-size stones: smaller than 2.5 inches (6.5 cm) but retained on a No. 10 (2 mm) U.S. Standard sieve. The minimum figure of 20 percent is estimated to be the lower limit at which gravel can be economically extracted from a deposit. Lower quality deposits have been worked in areas where haulage distances are short and a market for sand exists. (Woodard-USGS)
W76-12789

LAND-USE CLASSIFICATION MAP OF THE BOULDER-FORT COLLINS-GREELEY AREA, FRONT RANGE URBAN CORRIDOR, COLORADO,
Geological Survey, Denver, Colo.
L. B. Driscoll.
For sale USGS, Reston, Va., 22092, price $1.75.
Miscellaneous Investigations Series Map I-855-B, 1974. 1 sheet, 1 map, 1 ref.

Descriptors: *Land use, *Land classification, *Maps, *Urbanization, *Available water, Land resources, Watersheds(Basins), Surface waters, Land management, *Colorado.
Identifiers: *Front Range Urban Corridor(Colo), Boulder-Fort Collins-Greeley area(Colo).

The Front Range Urban Corridor of Colorado is undergoing rapid urbanization and sprawl. Land-use mapping is the first type of information needed

to provide a comprehensive picture of the distribution of the uses of land and an implication about the balance of the uses. Combined with maps of resources, soil types, water availability, topography, demography, etc., the limitations of the land can be established. At this stage land-use zoning can create the kind of end product desired. This map, then, provides for the Boulder-Fort Collins-Greeley area the first very crucial step in moving toward the prevention of incompatible land uses in the future. The Front Range Urban Corridor extends from Fort Collins on the north to Fountain on the south, and from the foothills on the west to Greeley on the east. (Woodard-USGS)
W76-12790

MAP OF ROCK TYPES IN BEDROCK OF ALLEGHENY COUNTY, PENNSYLVANIA,
Geological Survey, Harrisburg, Pa.
W. R. Kohl, and R. P. Briggs.
Available from Branch of Distribution, USGS 1200 S. Eads St. Arlington, VA 22202, $1.50. Miscellaneous Field Studies Map MF-685 A, 1975. 2 sheets, 2 maps, 2 fig, 2 tab, 36 ref.

Descriptors: Planning, Water resources development, *Land development, *Mineral industry, *Maps, *Pennsylvania, Geology, Rock properties, Bedrock.
Identifiers: *Allegheny County(Pa).

This map (Allegheny County, Pa.) is a tool useful in planning where a knowledge of characteristics of material to be moved, built upon, or otherwise utilized is necessary to adequately develop land, mineral, and water resources. Possible fields of application include land-use control, road construction, urban and industrial development water supply, and the search for nonmetallic mineral resources. On the map (scale 1:50,000 or 1 inch equals just over 4,000 feet), the types of rock likely to be found at or near the surface throughout the county are indicated by letter symbols keyed to the map explanation and two accompanying tables. Table 1 estimates the general engineering characteristics of the rock units, and table 2 describes the most common rock types in greater detail. Geological terms that may be unfamiliar are explained in the glossary. (Woodard-USGS)
W76-12791

ANNUAL SUMMARY OF GROUND-WATER CONDITIONS IN ARIZONA, SPRING 1974 TO SPRING 1975.
Geological Survey, Tucson, Ariz.
H. M. Babcock.
Water-Resources Investigations 76-59 (open-file report), May 1976. 2 sheets, 1 map.

Descriptors: *Groundwater resources, *Water fluctuations, *Pumping, *Irrigation, *Arizona, *Maps, Aquifers, Water wells, Water yield, Projections, Data collections, Water utilization, Water levels.

The withdrawal of ground water was slightly more than 5.7 million acre-feet in Arizona in 1974--the largest amount pumped in any year since the beginning of record. About 4.9 million acre-feet of ground water was used for the irrigation of crops in 1974. The Salt River Valley and the lower Santa Cruz basin are the largest agricultural areas in the State. For 1970-74, ground-water withdrawal in the two areas was about 8.3 and 4.6 million acre-feet, respectively, and, in general, water levels are declining. Other areas in which ground-water withdrawals have caused large water-level declines are the Willcox, San Simon, upper Santa Cruz, Avra Valley, Gila Bend, Harquahala Plains, and McMullen Valley areas. Two small scale maps of Arizona show (1) pumpage of ground water by areas and (2) the status of the ground-water inventory in the State. The map of the State at a scale of 1:500,000 shows potential well production, depth to water selected wells in spring 1975, and change in water level in selected wells from 1970 to 1975. The brief text that accompanies the maps summarizes the current ground-water conditions in the State. (Woodard-USGS)
W76-12792

HYDROLOGIC UNIT MAP--1974, STATE OF MONTANA.
Geological Survey, Reston, Va.
For sale by USGS, Reston, Va, 22092, $3.00. Hydrologic Unit Map, 1976. 2 sheets, 2 maps.

Descriptors: *Maps, *Hydrology, *Montana, Water resources, Data collections, Planning, Hydrologic systems, Regions, Land resources.
Identifiers: *Hydrologic unit maps(Mont), Hydrologic boundaries, Subregions, Accounting units, Cataloging units.

This map and accompanying table show Hydrologic Units in Montana that are basically hydrographic in nature. The Cataloging Units shown will supplant the Cataloging Units previously used by the U.S. Geological Survey in its Catalog of Information on Water Data (1966-72). The Regions, Subregions and Accounting Units are aggregates of the Cataloging Units. The Regions and Subregions are currently (1974) used by the U.S. Water Resources Council for comprehensive planning, including the National Assessment, and as a standard geographical framework for more detailed water and related land-resources planning. The Accounting Units are those currently (1974) in use by the U.S. Geological Survey for managing the National Water Data Network. (Woodard-USGS)
W76-12793

MAP SHOWING AVAILABILITY OF HYDROLOGIC DATA PUBLISHED BY THE U. S. ENVIRONMENTAL DATA SERVICE, AND BY THE U.S. GEOLOGICAL SURVEY AND COOPERATING AGENCIES, GREATER DENVER AREA, FRONT RANGE URBAN CORRIDOR, COLORADO.
Geological Survey, Denver, Colo.
E. R. Hampton.
For sale by USGS, Reston, Va, 22092, $1.25. Miscellaneous Investigations Series Map I-856-C, 1975. 1 sheet, 1 map, 41 ref.

Descriptors: *Hydrologic data, *Surface waters, *Groundwater, *Water quality, *Maps, Data collections, Sites, Bibliographies, Publications, Streamflow, Sediment transport, Water wells, *Colorado.
Identifiers: *Denver area(Colo).

This map shows types and locations of the hydrologic data published as of January 1974 for the Greater Denver Area by the U.S. Environmental Data Service and by the U.S. Geological Survey and cooperating agencies. The sources of the data are given in both the discussion and the reference. Climatological data include records of precipitation, temperature, and evaporation. Surface-water data include continuous record of stage and discharge of streams; crest-stage and low-flow discharge of streams; chemical quality of streams, lakes, and reservoirs; sediment load of streams; and stage of reservoirs. Locations of 46 surface-water data sites are shown on the map. Groundwater data sites plotted on the map represent 218 wells where water levels have been measured periodically for 4 or more years or monthly for at least 1 year, and 366 wells from which water samples have been analyzed for dissolved-chemical constituents. (Woodard-USGS)
W76-12794

MAP SHOWING LAKES IN THE GREATER DENVER AREA FRONT RANGE URBAN CORRIDOR, COLORADO,
Geological Survey, Denver, Colo.
T. W. Danielson.
For sale by USGS, Reston, Va, 22092, $1.25. Miscellaneous Investigations Series Map I-856-B, 1975. 1 sheet, 1 map, 1 tab.

Descriptors: *Lakes, *Lake morphom
*Maps, *Limnology, *Water quality, *
morphology, Lake shores, Chemical anal
Biological properties, Light penetration, Se
disks, Algae, *Colorado.
Identifiers: *Denver area(Colo).

This map report of the Greater Denver, Colo., includes data for 49 lakes that have surface greater than 10 hectares(about 25 acres). T lakes have a total combined area of 3,686 hec and a total shoreline of 185 kilometers (115 m The largest are Barr Lake, 708 hectares; Star Lake, 492 hectares; and Chatfield Lake, 465 tares. Barr Lake also has the longest shore 15.6 kilometers, and Gross Reservoir has the longest, 14.9 kilometers. In addition, 113 range in size from 2 to 10 hectares. These h total area of 526 hectares and a total shoreli 110 kilometers. Most of the lakes contain wat good quality. Most of the lakes contained that was alkaline. Slightly acidic water occ only in Marshall Lake (pH = 5.5). The highe (10.3) was measured in water from Reservoir the Rocky Mountain Arsenal grounds; Ken Reservoir was nearly as high with a pH of Values of pH of 8.5 or less occurred in 29 of t lakes measured. Transparency, as measured Secchi disk, was less than 1.2 meters in 17 51 lakes in which it was measured. It ranged 1.2 to 5.5 meters in the other 34 lakes. T parency was 5.0 meters in Gross Reservoi meters in McLellan Reservoir, and 0.5 met less in 8 of the lakes measured. (Woodard-US
W76-12795

MAP SHOWING POTENTIAL SOURCES GRAVEL AND CRUSHED-ROCK AGGREG IN THE GREATER DENVER AREA, FR RANGE URBAN CORRIDOR, COLORADO
Geological Survey, Denver, Colo.
D. E. Trimble, and H. R. Fitch.
For sale by USGS, Reston, Va., 22092, $1.75. Miscellaneous Investigations Series M 856-A, 1974. 1 sheet, 1 map, 1 tab, 33 ref.

Descriptors: *Fluvial sediments, *Ge mapping, *Gravels, *Rocks, *Quarries, M *Colorado, Rock mechanics, Particle size gregates, Flood plains, Glaciation.
Identifiers: *Denver area(Colo).

High-quality gravel in the Front Range Urba ridor, Colo., is restricted largely to areas be flood plains of major streams and to low te along these streams. Rock suitable for proc into crushed-rock aggregate is plentiful in the rocks of the mountains and in certain vo rocks of the foothills and plains. Potential s of gravel or of aggregate have been groupe seven map units--three of gravel and fo crushed-rock aggregate. A potential sour gravel, as here defined and mapped, conta percent of more of granule-and pebble-size (smaller than 2.5 in. or 6.4 cm, but retaine No. 10 U.S. Standard sieve). The minimum content was placed arbitrarily at 20 percent deposit because this is the most likely eco limit under the most adverse foreseeable tions. The map units are based on differen physical characteristics, which, in turn, det relative quality for different uses. (Wo USGS)
W76-12796

LAKES IN THE COLORADO SPRINGS TTLE ROCK AREA, FRONT RANGE U CORRIDOR, COLORADO,
Geological Survey, Denver, Colo.
D. B. Adams.
For sale USGS, Reston, Va., 22092, price Geological Survey Miscellaneous Investig Series Map I-857-E, 1976. 1 sheet, 1 map, 4 ref.

scriptors: *Lakes, *Water quality, rbanization, *Environmental effects, *Maps, ter utilization, Water demand, Lake phometry, Chemical analysis, Physical pro-ies, Limnology, Biological properties, Water perature, *Colorado.
ntifiers: *Lake inventory, *Colorado Springs-tle Rock area(Colo).

many lakes in Colorado's semiarid Front ge Urban Corridor are highly valued by the s' residents. In the past they were used arily to store water for irrigation and domestic . Today, rapid suburban development in the t Range Urban Corridor is accompanied by a in the principal use of many lakes to recrea-and centers of real estate development. These e lakes are threatened with a general deteriora-of chemical and biological quality caused by ging land and lake use in the area. This report ents the results of an inventory of the lakes in southern one-third of the Colorado Front ge Urban Corridor. Data on physical size are ded for most lakes of 2 hectares (20,000 re meters, about 5 acres) or greater, and r-quality data are provided for most lakes r than 5 hectares (about 12 acres). (Woodard-S)
-12797

ER FOR INDUSTRIAL AND AGRICUL-AL DEVELOPMENT IN COAHOMA, DE D, PANOLA, QUITMAN, TATE, AND TU-A COUNTIES, MISSISSIPPI,
ogical Survey, Jackson, Miss.
rimary bibliographic entry see Field 3E.
-12798

CTUATIONS OF GROUND-WATER ELS IN LEE COUNTY, FLORIDA, IN 1974,
ogical Survey, Tallahassee, Fla.
rimary bibliographic entry see Field 4B.
12801

ROLOGIC DATA FOR URBAN STUDIES HE DALLAS, TEXAS METROPOLITAN A, 1974,
gical Survey, Austin, Tex.
Hampton.
-file report, June 1976. 182 p, 4 fig, 3 tab, 7

iptors: *Hydrologic data, *Urban hydrology, n runoff, *Streamflow, *Urbanization, Data tions, Flood frequency, Gaging stations, runoff, Rainfall-runoff relationships, graphs, Mass curves, *Texas.
fiers: *Dallas metropolitan area(Tex).

eport presents the compilation and analysis drologic data collected in urban or partly drainage basins in the Dallas, Texas, politan area during the 1974 water year. The ives of the Dallas area program, which in 1961, are: (1) To determine, on the basis torical data and hydrologic analyses, the tude, frequency, and areal extent of flood-) To document and define floods of greater rdinary magnitude. (3) To determine the ef-f urban development on flood peaks and e. The studies involve the collection of itation, runoff, and flood-elevation data in inage basins within the city and 3 drainage outside the city in Dallas County. Two of drainage basins in Dallas have headwaters l areas outside the city limits, but the largest each drainage basin is within the city. The ge basins within the city include Joes Creek, an Branch, Turtle Creek, White Rock Elam Creek, Coombs Creek, Cedar Creek, le Creek, Newton Creek, and Whites . The three drainage basins outside the city las are Tenmile Creek, Duck Creek, and Mesquite Creek. (Woodard-USGS)
2804

A PLAN FOR STUDY OF WATER AND ITS RELATION TO ECONOMIC DEVELOPMENT IN THE GREEN RIVER AND GREAT DIVIDE BASINS IN WYOMING,
Geological Survey, Cheyenne, Wyo.
For primary bibliographic entry see Field 6D.
W76-12805

DATA ON SELECTED LAKES IN WASHINGTON, PART 4,
Geological Survey, Tucson, Ariz.
J. B. McConnell, G. C. Bortleson, and J. K. Innes.
Washington Department of Ecology, Olympia, Water-Supply Bulletin 42, Part 4, 1976. 141 p, 1 fig, 32 ref.

Descriptors: *Lakes, *Basic data collections, *Water quality, *Lake morphology, *Washington, Baseline studies, Chemical properties, Physical properties, Biological properties, Bathymetry, Maps, Aerial photography, Water temperature.

This report, the fourth in a series, contains chemical, biological, and physical data collected from 31 lakes in Washington during 1973. For each lake there is a description of the physical setting, a general discussion of water quality, a bathymetric map, and an aerial photograph. The basic data include depth profiles of dissolved-oxygen concentration and temperature. Each lake was sampled four times, from winter to late summer. In general, the study consists of a data-collection program designed to (1) document the present water quality and the overall status of the lakes, and (2) provide basic data pertaining to the physical, cultural, and water-quality characteristics of lakes in order to establish a base of reference that will allow future periodic reappraisals of lake conditions and evaluation of changes. (Woodard-USGS)
W76-12808

ORGANICS IN DRINKING WATER. PART II. MASS SPECTRAL IDENTIFICATION DATA,
Ames Lab., Iowa.
For primary bibliographic entry see Field 5A.
W76-12812

PUBLIC GROUNDWATER SUPPLIES IN LAKE COUNTY,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 4B.
W76-12824

COMPARISON OF REQUIRED RESERVOIR STORAGES COMPUTED BY THE THOMAS-FIERING MODEL AND THE 'KARLSRUHE MODEL' TYPE A AND B,
Karlsruhe Univ. (West Germany). Institut fuer Wasserbau III.
For primary bibliographic entry see Field 4A.
W76-12832

COMPUTER HALTS FLOODING COMPLAINTS,
Watermation, Inc., Saint Paul, Minn.
For primary bibliographic entry see Field 5D.
W76-12905

DATA ANALYSIS AND SYSTEM MODELLING IN URBAN CATCHMENT AREAS (IN THE NEW TOWN OF LELYSTAD, THE NETHERLANDS),
IJsselmeerpolders Development Authority, Lelystad (Netherlands). Scientific Div.
For primary bibliographic entry see Field 2A.
W76-12981

SURFACE WATER TEMPERATURES AT SHORE STATIONS, UNITED STATES WEST COAST, 1973.
Scripps Institution of Oceanography, La Jolla, Calif.

Available from the National Technical Information Service, Springfield, VA 22161 as ADA-009 937, $3.50 in paper copy, $3.00 in microfiche. Report SIO Ref 75-8, April 1975. 27 p.

Descriptors: *On-site data collections, *Sea water, *Water temperature, *Coasts, *Washington, *Oregon, *California, Data collections, Salinity, Monthly, Average, *Pacific coast region, Pacific Ocean.

Sea surface temperature and salinity data observed during 1973 along the west coast of North America from the straight of Juan de Fuca, Washington to La Jolla, California were presented. The data consisted of monthly means, ranges, and standard deviations based on daily observations. (Humphreys-ISWS)
W76-12995

WICHITA FALLS IMIS PROJECT. WATER UTILITY PROCESSING SYSTEM APPLICATION EVALUATION REPORT,
Kansas Univ., Lawrence. Inst. for Social and Environmental Studies.
For primary bibliographic entry see Field 3D.
W76-13040

FLOOD PLAIN INFORMATION, LOWER BUFFALO CREEK AND ITS TRIBUTARIES, NAHUNTA AND BRANTLEY COUNTY, GEORGIA.
Army Engineer District, Savannah, Ga.
For primary bibliographic entry see Field 4A.
W76-13045

FLOOD PLAIN INFORMATION: SCIOTO AND OLENTANGY RIVERS, OHIO, CHILLICOTHE AREA SUMMARY REPORT,
Army Engineer District, Huntington, W. Va.
For primary bibliographic entry see Field 4A.
W76-13046

FLOOD PLAIN INFORMATION: VERDIGRIS, FALL AND ELK RIVERS, KANSAS.
Army Engineer District, Tulsa, Okla.
For primary bibliographic entry see Field 4A.
W76-13047

FLOOD HAZARD ANALYSES: ROYAL RIVER AND CHANDLER BROOK, TOWN OF NORTH YARMOUTH, MAINE.
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 4A.
W76-13053

AVAILABILITY OF GROUND WATER IN THE MIDDLE CONNECTICUT RIVER BASIN, WEST-CENTRAL NEW HAMPSHIRE,
Geological Survey, Concord, N. H.
J. E. Cotton.
Water-Resources Investigations 76-18 (open-file report), 1976. 1 sheet, 4 ref.

Descriptors: *Groundwater availability, *Water quality, *Groundwater resources, Aquifers, *New Hampshire, Maps, Hydrologic data, Water wells, Springs.
Identifiers: *Middle Connecticut River basin(NH).

This map provides a preliminary assessment of the availability of ground water in the New Hampshire part of the middle Connecticut River basin. It is a generalization of several hydrogeologic factors and provides a guideline for ground-water exploration which is useful in water- and land-use planning. The best aquifers in the basin are deposits of stratified sand or sand and gravel of Pleistocene age. Large aquifers of this type occur in the Ammonoosuc River valley (a tributary of the Connecticut River) and in valleys of tributaries to the Ammonoosuc River. Smaller aquifers occur

in the Connecticut River valley and in the valleys of other tributaries. Ground water is generally of good chemical quality. Iron and manganese in concentrations greater than the recommended limits for drinking water suggested by the U. S. Public Health Service are not uncommon. (Woodard-USGS)
W76-13062

COMPILING BATHYMETRY FOR FLOW SIMULATION MODELS,
Geological Survey, Reston, Va.
R. W. Schaffranek, and R. A. Baltzer.
In: Symposium on Modeling Techniques, Volume II; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 1329-1346, 1975. 7 fig, 5 ref.

Descriptors: *Bathymetry, *Model studies, *Flow characteristics, *Data processing, Methodology, Data collections, Deep water, Contours, Computers, Monitoring, Navigation.

A highly modular, automated bathymetric data collection and processing system has been developed by the U. S. Geological Survey in support of its modeling effort. This system permits rapid, economical collection and processing of the detailed bathymetric data required to properly schematize the bottom configuration of river, estuary, lake, reservoir and (or) coastal embayment models. The system is composed of electronic equipment used to acquire the data and a closely integrated comprehensive set of computer programs to process the data. Hardware components include a precision radio ranging unit, a depth sounder, a precision clock, a digital plotter, a digital tape recorder, and a mini-computer that controls and monitors the operation of the individual components. The computer software system is designed to process edit, verify, triangulate, collate and otherwise transform the bathymetric data into numerical arrays or graphical products in support of the modeling effort. (See also W76-10415) (Woodard-USGS)
W76-13064

WATER RESOURCES DATA FOR SOUTH CAROLINA, WATER YEAR 1975.
Geological Survey, Columbia, S. C.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-251 855, $7.75 in paper copy, $3.00 in microfiche. Water-Data Report SC-75-1, 1976. 210 p, 4 fig, 4 tab, 25 ref.

Descriptors: *South Carolina, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Flow rate, Gaging stations, Lakes, Reservoirs, Chemical analysis, Sediments, Water temperature, Sampling sites, Water levels, Water analysis, Basic data collections.

Water resources data for the 1975 water year for South Carolina consists of records of stage, discharge, and water quality of streams; stage and contents of lakes and reservoirs; and water levels in wells. This report contains discharge records for 56 gaging stations; stage only records for 4 gaging stations; stage and contents for 11 lakes and reservoirs; water quality for 19 gaging stations and 4 ungaged stations; and water levels for 26 observation wells. Also included are 25 crest-stage partial-record stations. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in South Carolina. (Woodard-USGS)
W76-13066

WATER RESOURCES DATA FOR NORTH CAROLINA, WATER YEAR 1975.
Geological Survey, Raleigh, N.C.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-251 860, $11.75 in paper copy, $3.00 in microfiche. Water-Data Report NC-75-1, 1976. 426 p, 3 fig, 4 tab, 30 ref.

Descriptors: *North Carolina, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Flow rates, Gaging stations, Lakes, Reservoirs, Chemical analysis, Sediments, Water temperature, Sampling sites, Water levels, Water analysis, Basic data collections.

Water resources data for the 1975 water year for North Carolina consists of records of stage, discharge, and water quality of streams; stage and contents of lakes and reservoirs; and water levels in wells. This report contains discharge records for 149 gaging stations; stage an contents for 23 lakes and reservoirs; water quality for 45 gaging stations and 42 miscellaneous sites; and water levels for 52 observation wells. Also included are 16 crest-stage partial-record stations. Additional water data were collected at various sites, not part of the systematic data collection program, and are published as miscellaneous measurements. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in North Carolina. (Woodard-USGS)
W76-13067

WATER RESOURCES DATA FOR SOUTH DAKOTA, WATER YEAR 1975.
Geological Survey, Huron, S. Dak.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-251 861, $9.25 in paper copy, $3.00 in microfiche. Water-Data Report SD-75-1, 1976. 279 p, 6 fig, 4 tab, 30 ref.

Descriptors: *South Dakota, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Flow rates, Gaging stations, Lakes, Reservoirs, Chemical analysis, Sediments, Water temperature, Sampling sites, Water levels, Water analysis, Basic data collections.

Water resources data for the 1975 water year for South Dakota consists of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels and water quality in wells and springs. This report contains discharge records for 95 gaging stations; stage for 10 lakes and reservoirs; water quality for 26 gaging stations, 10 partial-record flow stations, one lake, and 105 wells; and water levels for 16 observation wells. Also included are 105 crest-stage partial-record stations. Additional water data were collected at various sites, not part of the systematic data collection program, and are published as miscellaneous measurements. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in South Dakota. (Woodard-USGS)
W76-13073

WATER RESOURCES DATA FOR IOWA, WATER YEAR 1975.
Geological Survey, Iowa City, Iowa.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-251 858, $9.75 in paper copy, $3.00 in microfiche. Water Data Report IA-75-1, 1976. 305 p, 4 fig, 4 tab, 3 ref.

Descriptors: *Iowa, *Hydrologic data, *Surface water, *Groundwater, *Water quality, Flow rates, Gaging stations, Lakes, Reservoirs, Chemical analysis, Sediments, Water temperature, Sampling sites, Water levels, Water analysis, Basic data collections.

Water resources data for the 1975 water year for Iowa consists of records of stage, discharge, and water quality of streams; stage, contents a water quality of lakes and reservoirs and wa levels in wells. This report contains dischar records for 112 gaging stations; stage or conte for 8 lakes and reservoirs; water quality for 41 g ing stations of which 24 have periodic or misc laneous sampling frequencies; 302 partial-reco flow stations; and water levels for 47 observati wells. Also included are data for 128 crest-st partial-record stations and 321 low-flow parti record stations. Additional water data were c lected at various sites, not part of the systems data collection program, and are published miscellaneous measurements. These d represent that part of the National Water D System operated by the U.S. Geological Surv and cooperating State and Federal agencies Iowa. (Woodard-USGS)
W76-13074

WATER RESOURCES DATA FOR KENTUCK WATER YEAR 1975.
Geological Survey, Louisville, Ky.
Available from the National Technical Infor tion Service, Springfield, VA 22161 as PB-251 $10.00 in paper copy, $3.00 in microfiche. Wa Data Report KY-75-1, 1976. 334 p, 5 fig, 4 tab, ref.

Descriptors: *Kentucky, *Hydrologic d *Surface waters, *Groundwater, *Water qual Flow rates, Gaging stations, Lakes, Reservo Chemical analysis, Sediments, Water temp ture, Sampling sites, Water levels, Water analy Basic data collections.

Water resources data for the 1975 water year Kentucky consists of records of stage, dischar and water quality of streams; stage and content lakes; and water levels and water quality of w and springs. This report contains discha records for 124 gaging stations; stage and conte for 13 lakes; water quality for 55 gaging statio 15 water-quality stations, 36 miscellaneous tions, and 30 wells and springs; and water le for 41 observation wells. Also included are for 73 crest-stage partial-record stations and low-flow partial-record stations. Additional w data were collected at various sites, not part of systematic data collection program and published as miscellaneous measurements. Th data represent that part of the National W Data System operated by the U.S. Geological S vey and cooperating State and Federal agencie Kentucky. (Woodard-USGS)
W76-13075

SURFACE WATER SUPPLY OF THE UNIT STATES, 1966-70: PART 5. HUDSON BAY A UPPER MISSISSIPPI RIVER BASINS--VOLU 2. UPPER MISSISSIPPI RIVER BASIN ABO KEOKUK, IOWA.
Geological Survey, Reston, Va.
Available from the Supt. of Documents, G Washington, DC 20402, Price $6.30. Water-Sup Paper 2114, 1976. 785 p, 1 fig.

Descriptors: *Hydrologic data, *Surface wat *Streamflow, *Lakes, *River basins, Illin Iowa, Minnesota, Wisconsin, Run Discharge(Water), Gaging stations, Flow meas ment, Average flow, Reservoir stag *Mississippi River.
Identifiers: *Hudson Bay basin, *Upper Missis pi River basin, Maximum discharges, Minim discharges.

This is one of 37 reports presenting records stage and discharge of streams, and of stage contents of lakes and reservoirs in the Un States during the 1966-70 water years; it cont the records for gaging stations and partial-rec stations in the upper Mississippi River basin ab Keokuk, Iowa. This report is one of the second ries of water-supply papers to be published on year basis. The first series covered the 5-y

od October 1, 1960, to September 30, 1965. series covers the period October 1, 1965, to ember 30, 1970. The daily table for stream- g stations gives the mean discharge for each nd is followed by monthly and yearly summa- of total, average, maximum, and minimum arges. (Woodard-USGS)
13076

EX TO NATIONAL TOPOGRAPHIC MAPS: ,000-SCALE SERIES.
ogical Survey, Reston, Va.
onal Topographic Maps, November 1975. 1

riptors: *Indexing, *Maps, *Topographic ing, *Drainage area, *United States, ing, Water resources development, Con- ion, Land development, Highways, nes, Geological surveys.
ifiers: *Drainage basins, *State maps, rangle maps.

:250,000-scale maps named on this index are of the National Topographic Map Series hed by the Geological Survey, which in- s several series of quadrangle and other topo- ic maps of the United States, Puerto Rico, Islands, American Samoa, and Guam. multicolored maps are drawn on a trans- Mercator projection and are generally hed in quadrangle units of 1 degree of le by 2 degrees of longitude. The paper size ut 22 by 34 inches. The contour interval s from 50 feet in relatively flat areas to 200 mountainous regions. Supplementary con- at one-half the basic contour interval are imes added in areas of low relief. One inch map represents about 4 miles on the ground. se of the limitations of this scale, detail is hat generalized and some small features are d. The maps are useful in planning projects ling over large areas, such as highway loca- oil and gas pipeline routes, transmission selection of radio and television station geologic investigations, studies of drainage , and for other purposes. (Woodard-USGS)
3077

E-DIFFERENCE MODEL FOR AQUIFER LATION IN TWO DIMENSIONS WITH TS OF NUMERICAL EXPERIMENTS,
ical Survey, Reston, Va.
mary bibliographic entry see Field 2F.
3085

VERVIEW OF THE PRECIPITATION ESSING SYSTEM AT THE SOUTHWEST RSHED RESEARCH CENTER,
tural Research Service, Tucson, Ariz. est Watershed Research Center.
hery, Jr., and R. S. Kagan.
epartment of Agriculture, ARS, Western , p 48-59, June 1976. 2 fig, 2 tab.

tors: *Precipitation(Atmospheric), t(Rainfall), *Arizona, *New Mexico, *Data ing, Rain gages, Data storage and retrieval, ed management, Water yield, Water on.
ers: *Southwest Watershed Research Ariz), Modularization.

ed are various records kept in the est Watershed Research Center's C) precipitation data file and the ng scheme for information. The collection cessing of precipitation data is part of a ensive program to study the water yield rid rangeland watersheds in the Southwest pect to conservation measures and forage on; to determine the optimum utilization yield for local and downstream needs; and t data to aid planning and designing mea- control flash flood and sediment damage. Besides precipitation data, records are also made of stream flow, vegetation and soil surveys, infiltration tests, and meteorological, geologic, geomorphic and soil moisture data. Rainfall charts collected at the Arizona and New Mexico locations are sent to the SWWRC for coding, digitizing and final processing. The system's flow of data is charted and types of field instrumentation described. Classification and other processing steps are outlined, along with a system of data quality determination. (Jahns-Arizona)
W76-13132

INTERDISCIPLINARY APPLICATIONS AND INTERPRETATION OF EREP DATA WITHIN THE SUSQUEHANNA RIVER BASIN,
Pennsylvania State Univ., University Park. Office for Remote Sensing of Earth Resources.
For primary bibliographic entry see Field 7B.
W76-13188

8. ENGINEERING WORKS

8A. Structures

PLAN OF WORK, RED RIVER BASIN ABOVE DENISON DAM.
Soil Conservation Service, Temple, Tex.
For primary bibliographic entry see Field 4A.
W76-12816

VIBRATIONS OF EARTH DAMS.
Akademiya Nauk SSSR, Moscow. Institut Fiziki Zemli.
For primary bibliographic entry see Field 8D.
W76-12823

DRAINAGE MAINTENANCE PROGRAMS IN OHIO COUNTIES,
Ohio State Univ., Columbus. Cooperative Extension Service.
For primary bibliographic entry see Field 4A.
W76-13009

IDENTIFICATION AND NATURE OF DISPERSIVE SOILS,
Soil Conservation Service, Lincoln, Nebr.
For primary bibliographic entry see Field 8D.
W76-13170

8B. Hydraulics

TURBULENT CHARACTERISTICS OF DRAG-REDUCING FLOWS,
Agricultural Research Service, Oxford, Miss. Sedimentation Lab.
C. V. Alonso, W. H. Klaus, and K. F. Wylie.
Journal of Hydraulic Research, Vol. 14, No. 2, p 103-113, 1976. 6 fig, 27 ref.

Descriptors: *Turbulent flow, *Hydraulic transportation, *Polymers, *Aqueous solutions, *Energy dissipation, Equations, Laboratory tests, Eddies, Pipe flow, Drag, Hydraulics.
Identifiers: *Interactive layer model, *Spectral densities, Dilute polymer solutions.

The reduction of frictional losses in turbulent flows of dilute polymer solutions is of particular interest to the civil engineers concerned with the hydraulic transport of solids and dredge spoil for considerable distances overland. The drag reduction is believed to result from altering of the turbulent-eddy production in dilute polymer solutions so as to make the process less dissipative. The turbulence characteristics of polymer flows were investigated in the laboratory from measurements in water and in a polyethylene oxide aqueous solution, using hot-film anemometry. Mean velocities, turbulence intensities, energy spectra, and energy-dissipation rates were measured in a turbulent smooth-pipe flow. The results of the mean flow measurements indicated that the velocity profiles follow the interactive layer model proposed earlier. The spectral data for water and polymer solutions exhibited similar inertial and dissipation subranges, although near the wall the polymer flows had a more extended inertial subrange. The addition of polymer decreased the rate of energy dissipation. The drag reducing property of the polymer additives was found to be effective only in the inner-wall region of bounded turbulent flows. (Singh-ISWS)
W76-12826

SWIRLING CIRCULAR TURBULENT WALL JETS,
University Coll. of Engineering, Burla (India).
B. S. Pani, and N. Rajaratnam.
Journal of Hydraulic Research, Vol. 14, No. 2, p 145-154, 1976. 13 fig, 14 ref.

Descriptors: *Velocity, *Jets, *Walls, *Shear stress, Turbulent flow, Hydraulics, Fluid mechanics, Model studies, Graphical analysis, Mathematical studies.
Identifiers: *Wall jets, Circular wall jets, *Swirl, Swirling number, Velocity profiles, Circular jets, Bed shear stress.

An experimental study of swirling circular wall jets, with the swirl number equal to 0.141 and 0.265, showed that the axial velocity profiles in the center plane are similar and are well described by the curve of the simple plane wall jet. The axial velocity distribution in the transverse direction (parellel to the wall) was also similar (in the neighborhood of the wall) and was well described by the Goertler-type solution for the circular jet. The velocity scale decreased inversely with the axial distance whereas the length scales grew linearly with the axial distance. The effect of swirl was to make the velocity scale decay faster and it also made the jet spread more rapidly in the transverse direction. The swirl also reduced the centerline bed shear stress effectively. The distribution of the bed shear stress in the transverse direction was found to be similar. (Lee-ISWS)
W76-12828

MAJOR JUNCTION STRUCTURE VERIFIED BY MODELING,
Santa Barbara County Water Agency, Los Angeles, Calif.
C. H. Lawrance, and M. W. Dowd.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 102, No. HY4, Proceedings Paper 12066, p 499-513, April 1976. 5 fig, 1 tab, 1 ref, 2 append.

Descriptors: *Colorado River, *Model studies, *Hydraulic design, *Design, *Hydraulic models, *Hydraulic structures, Costs, Flow, Pipelines, Gates, Hydraulic gates, Water supply, Water hammer, Valves, Equations.
Identifiers: Tower configuration.

Two hydraulic models of alternative configurations of a junction structure involving two large water supply conduits were tested for efficiencies in mixing of the respective supply waters and for other hydraulic characteristics under a broad range of operational conditions. An open tower configuration having two concentric, vertical tanks and an enclosed piping cross configuration were both model tested. The tower configuration was found to be more efficient in mixing and acceptable in hydraulic characteristics, provided certain baffling was provided. The engineering evaluation also favored the tower configuration, which was subsequently constructed and found to operate generally as predicted by the modeling. (Morris-ISWS)
W76-12840

EXPERIMENTAL STUDY OF TURBULENT STRATIFIED SHEARING FLOW,
McGill Univ., Montreal (Quebec). Dept. of Civil Engineering and Applied Mechanics.
For primary bibliographic entry see Field 2L.
W76-12841

COASTAL DISPERSION OF POLLUTANTS,
Polish Academy of Sciences, Gdansk. Inst. of Hydraulic Research.
For primary bibliographic entry see Field 5B.
W76-12843

WAVE-INDUCED MASS TRANSPORT IN WATER WAVES,
Delaware Univ., Newark. Dept. of Civil Engineering; and Delaware Univ., Newark. Coll. Marine Studies.
For primary bibliographic entry see Field 2H.
W76-12844

ENTRAINMENT AND DRAG FORCES OF DEFLECTED JETS,
Stone and Webster Engineering Corp., Boston, Mass. Environmental Engineering Div.
D. T. L. Chan, J. T. Lin, and J. F. Kennedy.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 102, No. HY5, Proceedings Paper 12141, p 615-635, May 1976. 13 fig, 1 tab, 20 ref, 1 append. ONR N00014-68-A-0196-0004.

Descriptors: *Jets, *Hydraulics, *Drag, *Turbulent flow, *Mixing, Laboratory tests, Pressure, Mathematical studies, Momentum transfer, Measurement, Entrainment, Equations, Mathematics.
Identifiers: *Deflected jets, Wind tunnel experiments, Cross-flow velocity, Jet trajectories.

Experiments were carried out on a round turbulent jet with a Reynolds number of 200,000 discharged perpendicularly into crossflows in a wind tunnel. The jet-to-crossflow velocity ratio ranged from about two to nine. The drag force resulting from the pressure distribution around the jet was found to make a significant contribution to the momentum uptake by the jet only in the region just above the jet origin, while the momentum of the entrained fluid makes its principal contribution over the reach, where the jet has become fully developed, but is not yet extensively deflected. Integral-type analyses were developed, by solving the integrated equations of mass and momentum conservation and the kinematic relation, to predict jet behavior in the nearfield, curvilinear, and far field regions. The entrainment velocity was related to two components of the jet velocity relative to the crossflow velocity. The drag force on the jet was considered only in the near-field, jet dominated region. Values of the entrainment and drag coefficients were inferred from the experimental data analyzed within the framework of the analytical model. (Singh-ISWS)
W76-12969

SELECTIVE WITHDRAWAL CRITERIA OF STRATIFIED FLUIDS,
Catholic Univ. of America, Washington, D. C. Dept. of Civil and Mechanical Engineering.
T. W. Kao.
Journal of the Hydraulics Division, American Society of Civil Engineering, Vol. 102, No. HY6, Proceedings Paper 12188, p 717-729, June 1976. 6 fig, 1 tab, 18 ref, 2 append. NSF ENG 75-09347, ONR N0014-67-A-0377-0027, NR 062-498.

Descriptors: *Density stratification, *Discharge(Water), *Stratification, Withdrawal, Hydraulics, Equations, Water quality, Reservoirs, Columns, Flow, Laboratory tests, Channels.
Identifiers: *Selective level releases, Criteria, Columnar disturbances, Topographical effects.

A general criterion for the presence or absence of selective withdrawal in a fluid or arbitrary stratification due to a line sink in a channel was presented. Several examples were given. The criterion was based on whether the speed of upstream propagating columnar disturbances is greater or less than the initial uniform velocity induced by the line sink. The result was then extended to topographical influence in the form of a lateral contraction of the channel walls. Experiments were conducted and they verified the conclusions for the lateral contraction. The use of lateral contractions to insure uniform flow in a stratified channel or reservoir was indicated. (Lee-ISWS)
W76-12970

COMPARISON OF SINGLE-POINT INJECTIONS IN PIPE FLOW,
Middle East Technical Univ., Ankara (Turkey). Dept. of Civil Engineering.
A. M. Ger, and E. R. Holley.
Journal of the Hydraulics Division, American Society of Civil Engineering, Vol. 102, No. HY6, Proceedings Paper 12172, p 731-746, June 1976. 8 fig, 1 tab, 12 ref, 2 append.

Descriptors: *Pipe flow, *Tracers, Waste disposal, Instrumentation, Hydraulics, Industrial wastes, Jets, Equations, Mixing, Flow, Mathematical studies, Concrete additives.
Identifiers: Point source, Single-point injections.

For applications such as using tracer techniques for discharge measurements in pipes or using a segment of a pipe as a mixing chamber, it is desirable to know the rate at which the concentration of injected material becomes mixed within the pipe cross section. The distance required to achieve a given degree of mixing depends on the injection system and the pipe flow characteristics. The mixing for three single-point injection systems was compared. The three systems were center line source, a wall source, and a jet at the wall issuing perpendicularly to the pipe flow. It was learned that a center line source can provide the most rapid mixing, but it is extremely difficult to maintain the symmetry necessary to achieve the rapid mixing; the wall source gives the slowest mixing; the mixing for jet injection depends on M, the ratio of the jet momentum to the pipe momentum. For a jet injection, there was an optimum M which gave the most rapid mixing for given flow characteristics, and this mixing was more rapid than either a wall source or most practically achievable center line sources. (Lee-ISWS)
W76-12971

CLASSIFICATION AND ANALYSIS OF RIVER PROCESSES,
R. Kellerhals, M. Church, and D. I. Bray.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 102, No. HY7, Proceedings Paper 12232, p 813-829, July 1976. 5 fig, 2 tab, 42 ref, 1 append.

Descriptors: *Canada, *Geomorphology, *Channel morphology, *Aerial photography, *Flood plains, Hydraulics, *Alluvial channels, Slopes, River systems, Classification, Braiding, Sediment, Meanders, Land forming.
Identifiers: *Photointerpretation, *Alberta, Channel sinuosity.

Aerial photographs and brief field visits are frequently the only data sources for the preliminary design of river engineering works in remote or undeveloped areas. Even if short-term field data are available, they may be misleading because of the nonuniform rates at which river processes take place. The major active processes are, however, reflected in the river morphology so that correct classification and interpretation of channel, floodplain, and terrace features on maps and photographs can, to some degree, overcome a lack of long-term data. Rivers present a wide spectrum of intermediate forms between the familiar cla braided and meandering types. This reflec similarly wide spectrum of flow distribution, material size, sediment transport, and channel bility. Existing river classification schemes reviewed, and a modified system was propose take account of the gradual transition betw classical types. (Lardner-ISWS)
W76-12973

SHAPE AND SIZE OF ALLUVIAL CANALS,
Central Water and Power Research Station, Po (India).
S. V. Chitale.
Journal of the Hydraulics Division, Amer Society of Civil Engineers, Vol. 102, No. H Proceedings Paper 12260, p 1003-1011, July 19 fig, 6 tab, 6 ref, 2 append.

Descriptors: *Canal design, *Canals, *Alli channels, *Dimensions, Hydraulics, Cha flow, Slopes, Streambeds, Correlation anal Equations, Mathematical studies, Statistics.
Identifiers: *Lacey formulas.

Deviations of observed canal dimensions those given by Lacey formulas were investig In the process, shape and size characteristi canal section were found to give relation between the basic parameters, P, R, and S, w suggests that one of these could be selected the other two then acquired unique values sa ing the two equations regarding shape and Design formulas were evolved on the bas these equations, many of which were foun yield more accuracy than with the Lacey form (Lardner-ISWS)
W76-12975

FLOODWATER RETARDING STRUCT YIELD IMPACT,
Agricultural Research Service, Chickasha, Southern Plains Branch.
For primary bibliographic entry see Field 4A.
W76-12978

A GUIDE TO METHODS AND STANDA FOR THE MEASUREMENT OF WATER FL
National Bureau of Standards, Washington, Inst. for Basic Standards.
G. Kulin, and P. R. Compton.
Available from the National Technical Info tion Service, Springfield, VA 22161 as CO 10683, $5.00 in paper copy, $3.00 in microf Special Publication 421, May 1975. 97 p, 50 tab, 57 ref, 2 append.

Descriptors: *Flow measurement, *Flowm *Standards, *Instrumentation, Pipe flow, channels, Open channel flow, Water, Weirs, turi meters, Flow rates, Flow, Current me Water measurement, Stream gages, Ori Hydraulics, Nozzles, Flumes, Equations.
Identifiers: Parshall flumes, Elbow meters, netic flowmeters, Acoustic flowmeters, H-flu

Selected information sources on methods standards for making measurements of wate wastewater flow in the field were listed described. Both closed conduit and free su flows were treated, but emphasis was on channel flow measurements needed in resource engineering and in water pollution trol. Instruments and methods covered in weirs, flumes, current meters (and vel traverse methods), dilution techniques, pipe instruments, acoustic meters and others. In tion to summarizing the basic properties of instrument or method and referring users t best available sources of detailed informatio performance and field application, pot sources of error were described and quant where possible. The information presented tended to assist measurement supervisors their personnel engaged in establishing and op

water and wastewater flow measurement sta-
s in the field. It is geared to technical people
are not necessarily fluid mechanics spe-
sts. (Humphreys-ISWS)
-13000

HAMMERS,
ffield Services, Johannesburg (South Africa).
primary bibliographic entry see Field 8C.
-13026

ICIENCY-A WORLD OF FANTASY,
tralian Ground-water consultants Ltd., Sand-
Transvaal (South Africa).
primary bibliographic entry see Field 8G.
-13028

FF FOAM' DRILLING,
field Service, Johannesburg (South Africa).
of Drilling Technical Services Ltd.
cCallum.
nal of the Groundwater Association of South
South West Africa, Vol. 1, No. 2, p 4, 12, July,

riptors: *Drilling fluids, *Rotary drilling,
ming, Slurries, Boreholes, Water wells.
ifiers: *Stiff foam, Lost circulation, Annular
ity, Borehole erosion, Air requirements.

ry drilling with a stiff foam is an economical
s of drilling where problems have been en-
tered with air or mud drilling techniques. The
ntages of using a stiff foam are due to the low
ty fluid which prevent lost circulation, annu-
all erosion, and good hole cleaning capabili-
when drilling in sticky clays and gravels. The
foam concept is based on 'thickening' the air
e borehole can be cleaned at a low annular
ity (200-250 feet per minute). Due to the
annular velocity a substantial reduction in
equirements and a lower annulus pressure
s. Stiff foam is made up with a concentrated
ng agent added to a high yield bentonite slur-
ormally 7 to 10 gallons of slurry is injected
ch cubic foot of hole cut. Two variations of
jection method are used with stiff foam; the
uous injection and slug injection. Control of
stem is based on surface injection pressure,
tring torque, and condition and regularity of
in the discharge pipe. Stiff foam was
ally developed for conventional rotary air
g; however, this technique also adds greatly
capability of down-the-hole hammer drilling.
-NWWA)
3029

N-THE-HOLE INSURANCE,
ner and McDannald Co., Galena, Ohio.
imary bibliographic entry see Field 8G.
3032

NEERED IRRIGATION WELLS.
imary bibliographic entry see Field 4B.
3033

TEVER HAPPENED TO THE HYDRAULIC

mary bibliographic entry see Field 8C.
3034

IENT AQUIFER DEVELOPMENT IS
SSARY TO EXPLOIT FULL YIELD
NTIAL,
ld Services, Johannesburg (South Africa).
Drilling Technical Services Ltd.
obott.
of the Groundwater Association of South
st Africa, Vol. 1, No. 2, p 5-6, July, 1975. 1

Descriptors: *Drilling, *Boreholes, *Drilling equipment, *Porosity, Aquifers, Drawdown, Water wells, Groundwater, Water yield improvement.
Identifiers: *Well development, *Filtrate invasion, *Filtercake, *Aquifer damage, Drilling technique.

Inadequate aquifer development in production water well boreholes result in high well losses and consequent increased drawdown. A large number of wells which have been abandoned as dry or low yielding, in fact only require efficient aquifer development. Cable tool rig operators commonly continue drilling for long periods without baling the hole clean. This causes a large volume of fine tailings to be forced into the porous formation during the pounding action of the drill bit. Porosity is thereby reduced to a fraction of the original value. Likewise, circulation rotary drilling techniques circulate fine sand in the fluid which frequently invade porous sand aquifers. This is caused by the jetting action at the bit and the head pressure placed on the aquifer during fluid circulation. The down hole hammer method of drilling is less likely to cause aquifer damage due to the ability to flush 'fines' from the formation during drilling. With the use of revese circulation dquipment, aquifer invasion and damage can be kept to a minimum, particularly when drilling in stable hard rock environments where the circulation system can be 'starved'. The water drawn from the aquifer will flush out the cuttings. Each of these methods may be superior to the other in specific drilling situations. While damage to the aquifer is unavoidable in most cases, all reasonable care must be exercised to preclude this by proper selection of the drilling method and development technique. (Heiss-NWWA)
W76-13035

WELL CUTTINGS ANALYSIS IN GROUNDWATER RESOURCES EVALUATION,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
For primary bibliographic entry see Field 8G.
W76-13036

HOW TO DRILL A USABLE HOLE - PART 2, DESIGNING THE BOTTOMHOLE ASSEMBLY,
Drilco, Houston, Tex. Technical Services.
G. E. Wilson.
World Oil, Vol 183, No 4, p 47-51, September, 1976. 17 fig, 1 tab.

Descriptors: *Rotary drilling, *Drilling equipment, *Boreholes, *Borehole geophysics, Rock mechanics.
Identifiers: *Bottomhole assemblies, *Borehole deviations, *Packed hole theory, Pendulum theory, Drill collar design, Drill bit weighting.

Techniques are available to reduce or eliminate drill hole deviation. A popular method is to use the packed hole assembly. This method utilizes a series of stabilizers in the hole already drilled to guide the bit straight ahead. The bottom hole assembly is designed with the necessary stiffness and wall contact tools to force the bit to drill in the general direction of the hole already drilled. Design considerations given to packed hole assemblies are: tool assembly length, drill collar stiffness, clearance between the hole wall and stabilizers, and bottomhole assembly wall support. Proper design of a packed hole assembly requires that crooked hole tendencies and degree of formations drillability be considered. Crooked hole tendencies may be classed as either mild, medium or severe. Formation firmness is rated as soft to medium hard, and medium hard to hard, which is further divided into abrasive or non-abrasive. The stabilizing tools used in packed hole assemblies are of three basic types which include the rotating blade, the nonrotating rubber sleeve, the rolling cutter reamer and variations of the three. When it becomes necessary for total hole deviation to be reduced, the pendulum technique must be employed. In this technique, the pendulum length collars are swung below the regular packed hole assembly. By reducing the bit weight, bending characteristics of the drill string are changed and the hole will tend to be straighter. Recently it has been found that this is not always the best procedure because reducing the bit weight reduces penetration rate and frequently causes doglegs. (See also W76-11915) (Heiss-NWWA)
W76-13038

WATER QUALITY MODEL OF A SALT-WEDGE ESTUARY,
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 5B.
W76-13063

COMPILING BATHYMETRY FOR FLOW SIMULATION MODELS,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W76-13064

A SIMPLIFIED SLOPE-AREA METHOD FOR ESTIMATING FLOOD DISCHARGES IN NATURAL CHANNELS,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 4A.
W76-13083

AN ERTS-1 STUDY OF COASTAL FEATURES ON THE NORTH CAROLINA COAST,
Coastal Engineering Research Center, Fort Belvoir, Va.
For primary bibliographic entry see Field 7B.
W76-13174

TECHNIQUES IN EVALUATING SUITABILITY OF BORROW MATERIAL FOR BEACH NOURISHMENT,
Coastal Engineering Research Center, Fort Belvoir, Va.
W. R. James.
Available from the National Technical Information Service, Springfield, Va 22161 as AD/A-019 936, $5.00 in paper copy, $3.00 in microfiche. Report No. TM-60, December 1975. 81 p, 10 fig, 2 tab, 12 ref, 3 append.

Descriptors: *Beaches, *Model studies, *Erosion, *Beach erosion, Mathematical models, Shore protection, Coastal engineering, Seashores, Erosion control, Materials, Sands, Coasts, Shores.
Identifiers: *Borrow materials, Beach nourishment.

Selection of borrow material for use in beach restoration and periodic nourishment requires analysis of the textural differences between the potential borrow and native beach materials. Three quantitative techniques proposed for such analysis were reviewed and compared, and guidelines were suggested for use in planning and designing projects requiring beach nourishment. The techniques were of two types. One type was based on the assumption that sorting processes will selectively remove borrow material from the various size classes until a 'stable grain-size distribution' (gsd) is obtained and the placed fill is stabilized. The gsd of the native material was used to predict the character of the stable gsd. Methods of this type lead to calculation of a 'fill factor,' an estimate of volume of borrow material required to produce a unit volume of stable beach material. Another type of technique was based on the assumption that no material is absolutely stable, but that erosion rates depend in part on the gsd of the material exposed to existing coastal processes. Prediction of erosion rates associated with a given borrow material was based on observation of erosion rates and textural properties associated with native materials. This method resulted in a 'renourishment factor' for determining volumetric

requirements for periodic nourishment. Practical application of any of the methods is dependent on the engineering design, the historical behavior of the beach in the project area, and the techniques of handling the borrow material before and during its placement. (Sims-ISWS)
W76-13175

8C. Hydraulic Machinery

WATERWORKS OF THERMAL ELECTRIC POWER STATIONS,
V. N. Pokrovskii.
Available from the National Technical Information Service, Springfield, VA 22161 as JPRS 66221, $4.00 in paper copy, $3.00 in microfiche. Excerpt from the book: Vodosnabzheniye Teplovykh Elektrostantsiy. Moscow, 1958, 21 p, 11 fig, 3 tab.

Descriptors: Engineering, *Electrical engineering, Engineering structures, Electric powerplants, Design, Design criteria, Cooling towers, *Water supply, *Water works.
Identifiers: USSR.

A review is presented concerning questions of water supply to thermal electric power stations. The report here is concerned with graduating towers of two types: spray and dripwise. The paper is designed for water supply system design engineers and builders and thermal electric power station operating personnel and can be used as an aid by students in higher institutions of learning. (Chilton-ORNL)
W76-12811

SWIRLING CIRCULAR TURBULENT WALL JETS,
University Coll. of Engineering, Burla (India).
For primary bibliographic entry see Field 8B.
W76-12828

MAJOR JUNCTION STRUCTURE VERIFIED BY MODELING,
Santa Barbara County Water Agency, Los Angeles, Calif.
For primary bibliographic entry see Field 8B.
W76-12840

SEDIMENT FLUSHING AFTER DREDGING IN TIDAL BAYS,
Royal Inst. of Tech., Stockholm (Sweden). Dept. of Hydraulics.
K. Cederwall, and T. Svensson.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 102, No. HY7, Proceedings Paper 12229, p 935-953, July 1976. 10 fig, 3 tab, 16 ref, 2 append.

Descriptors: *Mathematical models, *Dispersion, *Dredging, *Sedimentation, Environmental engineering, Environmental effects, Estuaries, Hydraulics, Water pollution, Suspended load, Suspended solids, Bottom sampling.
Identifiers: *Sediment flushing, *One-dimensional dispersion, Dredging area, Dispersion model, Upper sediment layer, Resedimentation, Tidal flushing.

A one-dimensional dispersion model for tidal flushing of suspended material was formulated. It was suggested that this model could be used to predict the escape of suspended material from an estuarine dredging area out into the adjacent waters. The dispersion model included a sedimentation function to reproduce the effect of resedimentation. Calibration of the model was carried out in a restoration area by means of in-situ tracer tests and salinity measurements to establish the dispersive properties of the water body. The settling characteristics of the upper sediment layer were established by sedimentation analysis of bottom samples from the dredging area, divided into an organic (polluted) top layer and underlying inorganic sediment. (Roberts-ISWS)
W76-12974

ON HAMMERS,
Wellfield Services, Johannesburg (South Africa).
P. G. Herbert.
Journal of the Groundwater Association of South and South West Africa, Vol. 1, No. 3, p 14-15, December, 1975.

Descriptors: *Rotary drilling, *Drilling equipment, Drilling fluids, Fractures(Geology), Water wells, Boreholes, Clays.
Identifiers: *Airhammer bits, Bit weight, Bit life, Water injection, Foaming detergents, Drill string maintenance.

Constant attention to the rig while drilling and expertise at the controls will prevent a stuck hammer when using high pressure, air, rotary drilling techniques in fractured rock zones. Verticality and straightness of the borehole can be maintained by the use of large and long drill collars directly behind the hammer. Too little attention to the weight over the hammer can result in lost buttons off bits, poor bit life, broken bit shanks and even broken pistons. All of these result in lost time and money to the operator. Injection of water with a biodegradable foaming detergent at all times will prevent blowing dust, increase cooling for the hammer, aid in the returning the cuttings and help prevent lost circulation. Drilling through clays with a hammer bit is simplified by water injection, medium weight on the bit, and a relatively high speed (approximately 60 r.p.m.) rotation rate. Too much weight on the bit when drilling clays will result in 'plugging off' of the bit. Constant stripping and cleaning of air hammer bits is not necessary if care is taken in maintaining, protecting and using the bit. Maintenance includes the injection of soluable lubricating oil at all times during operation in sufficient quantities to line the inside of the drillrods. The rods should be kept clean with their threads protected at all times when not in use. Careful operation of the rig and common sense care of the downhole apparatus will give long equipment life and successful drilling while using hammer bits. (Heiss-NWWA)
W76-13026

WHATEVER HAPPENED TO THE HYDRAULIC RAM.
Ground Water Age, Vol. 10, No. 12, p 46, 48, 80-81, August, 1976. 4 fig.

Descriptors: *Hydraulic machinery, *Hydraulic systems, *Pumps, Hydraulic gradient, Heat pumps.
Identifiers: *Hydraulic rams.

The hydraulic ram has been used for more than 100 years for the pumping of water without the aid of any energy except the power generated by flowing water. Water is directed from a source, a stream, lake, spring or artesian well to the hydraulic ram by way of a drive pipe. When a sufficient volume of water has flowed through the waste valve to build enough pressure to close the outlet. When this occurs, the water is forced through the check valve and into the air chamber. The moving water compresses the air enclosed in the compartment so that it causes a piston-like action which closes the check valve and forces water up the delivery pipe to a storage tank for use. The device can be used to power small hydraulic electric generators as well as heat and cool buildings when used in conjunction with water-to-air heat pumps. The biggest disadvantages of the ram are: (1) the users access to a substantial amount of flowing water, (2) A sufficient drop or head difference between the water source and ram, (3) the length of intake or drive pipe from the water source to the ram, (4) the distance the water must be delivered, both horizontally and vertically. However, if conditions are right, the hydraulic ram is still the m pollution free and least expensive method getting water to run uphill. (Heiss-NWWA)
W76-13034

EFFICIENT AQUIFER DEVELOPMENT NECESSARY TO EXPLOIT FULL YI POTENTIAL,
Wellfield Services, Johannesburg (South Afri
Div. of Drilling Technical Services Ltd.
For primary bibliographic entry see Field 8B.
W76-13035

HOW TO DRILL A USABLE HOLE - PART DESIGNING THE BOTTOMHOLE ASSEMBL
Drilco, Houston, Tex. Technical Services.
For primary bibliographic entry see Field 8B.
W76-13038

WATER ACTION POWERED PUMP,
L. E. Hooper, III.
U. S. Patent No. 3,961,863, 6 p, 6 fig, 9 ref; O cial Gazette of the United States Patent Off Vol 947, No 2, p 689-690, June 8, 1976.

Descriptors: *Patents, *Waves(Wa *Currents(Water), *Energy transfer, Bodies water, Hydraulic equipment, Mechanical eq ment, *Pumps, Floats.

A method and apparatus are described for verting the natural surface motion of water usable energy by utilizing the force magnifica properties or mechanical advantage, of levera the strut members of a beam or truss structure efficiently activating a pump. At least one flex tubular pumping element is supported by float terconnected by means of a flexible multipl beam or truss structure. The pumping ac originates from the element being flexed axiall the multiplanar movement of the water actin the floats. The multiplanar movement of w and currents reflects a multiplanar truss syste the action of bending moments from flota flow resistance and gravity. Preferably at least parallel disposed pumping elements are utilize the apparatus, and two or more of these pairs connected for providing the desired pressure volume output. The flexible multiplanar t structure comprises a horizontal system and a tical system, both of which include lever struts having chord segment linkage between ends. (Sinha-OEIS)
W76-13138

METHOD OF REMOVING MATERIAL FR A BED OF A BODY OF WATER,
For primary bibliographic entry see Field 5G.
W76-13155

8D. Soil Mechanics

CONTINUING MEASUREMENTS OF SWELLING CLAY IN A PONDED CUT,
Texas Univ. at Austin. Center for High Research.
M. L. Steinberg.
Available from the National Technical Info tion Service, Springfield, VA 22161, as PB 546, $4.00 in paper copy, $3.00 in microfi Research Report 118-8, December 1974. 36 p fig, 6 ref.

Descriptors: *Ponding, *Road construct *Expansive clays, *Moisture, Moisture con Heaving, Roads, Highways, Clays, Soil, water, Soil mechaics, Soil engineering, Soil lants, Soil stabilization, Lime, Civil enginee Construction, Paving.

Ponding is a practical method of causing a which may heave to do so before a paveme

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ed rather than after. Results of observations of maintenance problems and pavement conditions were noted and an attempt was made to relate the depths of movement and effectiveness of ponding with the longer range goal of developing a method for reducing costs of roadway life. It is concluded that if the potential vertical rise ns likely to exceed one inch and the facility its it, ponding should be set up on cut and fill ions together with sand drains through the e of instability to get the moisture well into the ansive clay. Also, an evaporative seal of lime, erhaps emulsion asphalt with wide shoulders easily drained ditches, seems worthwhile. And lly, flexible asphaltic base and pavement ems seem possibly to function with the least ess and maintenance costs on these expansive s. (Sims-ISWS)
-12818

RATIONS OF EARTH DAMS.
demiya Nauk SSSR, Moscow. Institut Fiziki li.
ilable from the National Technical Informa- Service, Springfield, VA 22161 as TT-70- 8, $8.00 in paper copy, $3.00 in microfiche. slation TT-70-57268, 1974. 242p. Translation olebaniya Zemlyanykh Plotin. Voprosy Inz- rnoi Seismologii, No. 11. 1967.NSF C466.

riptors: *Dams, *Earth dams, *Vibrations, thquakes, Earthquake engineering, Dam dations, Dam failure, Foundation failure, rmation, Seismic waves, Explosions, Equa- , Hydraulic structures, Seismic design, nic studies, Seismology, Seismic properties, ctures.
tifiers: *USSR.

y hydraulic structures and a number of big are under construction in regions of the R prone to strong earthquakes. This collection 2 papers by USSR authors covered several lems of earth dams caused by the vibrations arthquakes and nearby explosion blasts. ral papers reported the measurements of tions in earth dams. Other papers reported ffects of these vibrations on foundations and es of the dams. Spectra of earth vibrations reported. A final paper summarized the in- gations in other countries on the problem of ic resistance of earth dams. (Sims-ISWS)
12823

TIFICATION AND NATURE OF DISPER- SOILS,
Conservation Service, Lincoln, Nebr.
Sherard, L. P. Dunningan, and R. S. Decker.
al of the Geotechnical Engineering Division, edings of American Society of Civil En- rs, Vol 102, No. GT4, p 287-301, April 1976. 6 tab, 21 ref.

riptors: *Clays, *Dams, *Earth dams, fill dams, *Erosion, *Soil properties, Col- Dispersion, Flocculation, Irrigation, Reser- Seepage, Soil mechanics.
fiers: *Geotechnical engineering, Pip- rosion).

fine-grained soils, called 'dispersive' soils higher content of dissolved pore-water sodi- an ordinary soils, rapidly erode forming tun- nd deep gullies by a process in which the in- al clay particles go into suspension in slow- g water (colloidal erosion), damaging earth canals, and other structures. Dispersive annot be differentiated from ordinary soils nventional soil mechanics tests. An in- ation in which four different laboratory tests spersion were performed on a considerable er of soils of diverse origins and properties ovided improved understanding of the pro- of dispersive soils and strengthened ication criteria. High pore-water sodium is med to be the main factor causing a soil to be dispersive, although there are a few exceptional low sodium dispersive soils. The newly developed pinhole test, in which erosion is measured directly by causing water to flow through a small hole in a compacted specimen, is the most reliable single test. (Bell-Cornell)
W76-13170

PORE-WATER PRESSURE CHANGES DURING SOIL LIQUIFACTION,
California Univ., Berkeley. Dept. of Civil Engineering.
H. B. Seed, P. P. Martin, and J. Lysmer.
Journal of the Geotechnical Engineering Division, Proceedings of the American Society of Civil Engineers, Vol. 102, No. GT4, p 323-346, April 1976. 16 fig, 3 tab, 18 ref.

Descriptors: *Earthquakes, *Pore water, *Pore pressure, Consolidation, Seepage, Vibration, Evaluation, Hydrostatic pressure, Sands, Analytical techniques, Drainage.
Identifiers: *Geotechnical engineering, *Liquefaction, Sand deposits.

An analytical procedure is presented for evaluating the general characteristics of pore-water pressure buildup and subsequent dissipation in sand deposits both during and following a period of earthquake shaking. It is shown that in layers of fine sand, excess hydrostatic pressures may persist for an hour or more after an earthquake. However, evidence of subsurface liquefaction may not appear at the ground surface until several minutes after the shaking has stopped and the critical conditions at the ground surface may not develop until 10 to 30 minutes after the earthquake. However, for coarse sands and gravels with an impedance of drainage due to the presence of sand seams or layers, pore pressures generated by earthquake shaking may dissipate so rapidly that no detrimental build-up of pore pressure or a condition approaching liquefaction can develop. Improving the drainage capability of a sand deposit may thus provide an effective means of stabilizing a potentially unstable deposit. Analyses of the type described also provide the means for assessing whether subsurface liquefaction will have any serious effects on structures supported near the ground surface. (Bell-Cornell)
W76-13171

8E. Rock Mechanics and Geology

MAP SHOWING POTENTIAL SOURCES OF GRAVEL AND CRUSHED-ROCK AGGREGATE IN THE COLORADO SPRINGS-CASTLE ROCK AREA, FRONT RANGE URBAN CORRIDOR, COLORADO,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 7C.
W76-12787

MAP SHOWING POTENTIAL SOURCES OF GRAVEL AND CRUSHED-ROCK AGGREGATE IN THE BOULDER-FORT COLLINS-GREELEY AREA, FRONT RANGE URBAN CORRIDOR, COLORADO,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 7C.
W76-12789

MAP OF ROCK TYPES IN BEDROCK OF ALLEGHENY COUNTY, PENNSYLVANIA,
Geological Survey, Harrisburg, Pa.
For primary bibliographic entry see Field 7C.
W76-12791

GROUNDWATER GEOPHYSICS IN SOUTH AFRICA,
Wellfield Services, Johannesburg (South Africa).
For primary bibliographic entry see Field 4B.
W76-13027

HOW TO DRILL A USABLE HOLE - PART 2, DESIGNING THE BOTTOMHOLE ASSEMBLY,
Drilco, Houston, Tex. Technical Services.
For primary bibliographic entry see Field 8B.
W76-13038

8G. Materials

GROUNDWATER GEOPHYSICS IN SOUTH AFRICA,
Wellfield Services, Johannesburg (South Africa).
For primary bibliographic entry see Field 4B.
W76-13027

EFFICIENCY-A WORLD OF FANTASY,
Australian Ground-water consultants Ltd., Sandton, Transvaal (South Africa).
M. W. Bell.
Journal of the Ground-Water Association of South and South West Africa, Vol. 1, No. 5, p 11-13, July 1976.

Descriptors: *Specifications, *Pump testing, *Groundwater, *Storage coefficient, *Yield equation, Boreholes, Water yield, Drawdown, Construction, Design, Aquifers, Water wells, Transmissivity, Permeability, Efficiencies.
Identifiers: *Borehole efficiency calculation, Radial flow, Gradient, Recovery, Hydraulic head.

The drilling specification is a document not well understood. In the forefront of the gap of understanding is the borehole efficiency clause. This clause is of immense importance as the efficiency of a pumped well determines the characteristics of the well. Good well design and construction aim to obtain a hydraulically efficient well that will give a required discharge and maintain a long life. Transmissivity, storage coefficient and drawdown are determined by hydraulic analysis, i.e., the pumping test. Efficiency must not change because of the aquifer character. The hydraulic efficiency of a well can be calculated if the hydraulic constants of transmissivity and storage are determined. These constants are determined by pumping a water well of a constant rate and measuring drawdown and/or recovery. A borehole efficiency calculation is based on the practical derivation of aquifer characteristics and it determines the damage created in installing the borehole into the aquifer. Poor drilling techniques can decrease near well permeability and increase well drawdown, and proper well development technique is required to rectify this. (Grober-NWWA)
W76-13028

'STIFF FOAM' DRILLING,
Wellfield Service, Johannesburg (South Africa).
Div. of Drilling Technical Services Ltd.
For primary bibliographic entry see Field 8B.
W76-13029

DOWN-THE-HOLE INSURANCE,
Plummer and McDannald Co., Galena, Ohio.
R. B. McDannald.
Water Well Journal, Vol. 30, No. 9, September, 1976. p. 20-21, 1 fig.

Descriptors: *Drilling equipment, Boreholes, Wells.
Identifiers: *Drilling jars, *Fishing jars, *Drilling jars specifications, *Drilling jar fabrication, Drill string, Stuck drilling tools, Drilling.

A drilling jar consists of two connecting links, called reins, with a pin joint at the upper end and a box joint on the lower. It is placed in the tool string between the socket and drill stem to prevent the bit from sticking. Welded jars are manufactured by forming two steel billets into reins and welding

one of the open ends to a pin joint and the other to a box joint. The reins are made of selected, heat-treated alloy steel. The drop and hammer forge weldless process from one piece of ally steel is a more expensive type of jar construction; however, the heat-treated forgings gives maximum safety and long life. Jars are measured by the diameter over the reins and may be purchased with joint sizes to match the diameters. However, the jar diameter should not exceed the box collar diameter of the selected joint. To insure against the jar opening with each drilling stroke, it is important to drill with a tight line. A slack line will damage the spade ends or fatigue and crack the reins. Fishing jars are the most important fishing tool the driller uses, and should be made of good quality steel and effectively heat-treated. The weight of the stem above the jar is the effective force in jarring loose the stuck tools. The wrist pin should be adjusted to effect a short stroke, which gives better control of the tools while fishing. Fishing jars are of the same construction as drilling jars, with the exception of a much longer stroke. The long stroke allows the fishing stem to hit a heavy jar when jarring up or down, but only one way when jarring on stuck tools. Jars with a 24' or 30' stroke are commonly used in shallow wells. Jars with a 36' stroke are normally used in gas and oil fields. (Grober-NWWA)
W76-13032

WELL CUTTINGS ANALYSIS IN GROUNDWATER RESOURCES EVALUATION,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
W. G. Matlock, G. C. A. Morin, and J. E. Posedly.
Ground Water, Vol 14, No 5, p 272-277, September-October, 1976. 4 fig, 5 ref.

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Identifiers: *Well cuttings, Tucson(Ariz).

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- Ground and surface water hydrology at the Illinois State Water Survey.
- Metropolitan water resources planning and management at the Center for Urban and Regional Studies of University of North Carolina.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Center of the University of Wisconsin.
- Eutrophication at the Water Resources Center of the University of Wisconsin.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.
- Water resource aspects of the pulp and paper industry at the Institute of Paper Chemistry.

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- Effect on water quality of irrigation return flows at the Department of Agricultural Engineering of Colorado State University.
- Agricultural livestock waste at East Central State College, Oklahoma.
- Municipal wastewater treatment technology at the Franklin Institute Research Laboratories.

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